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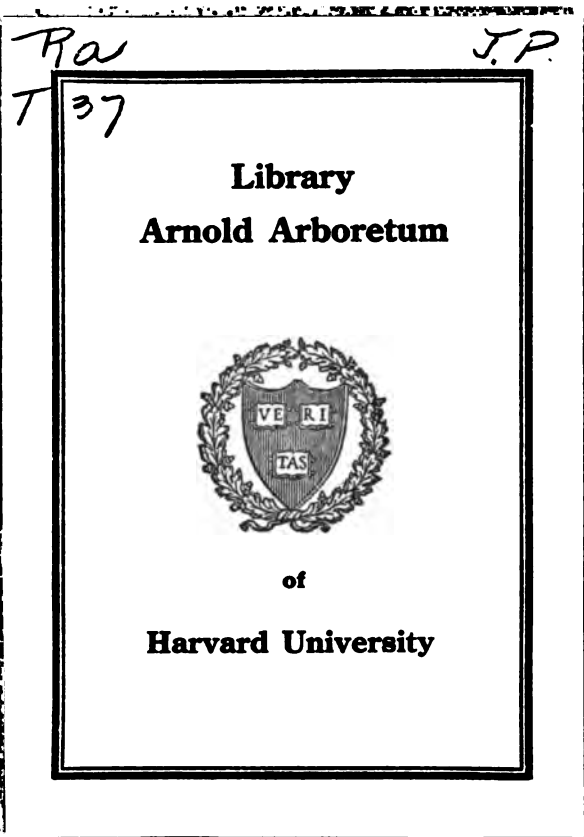
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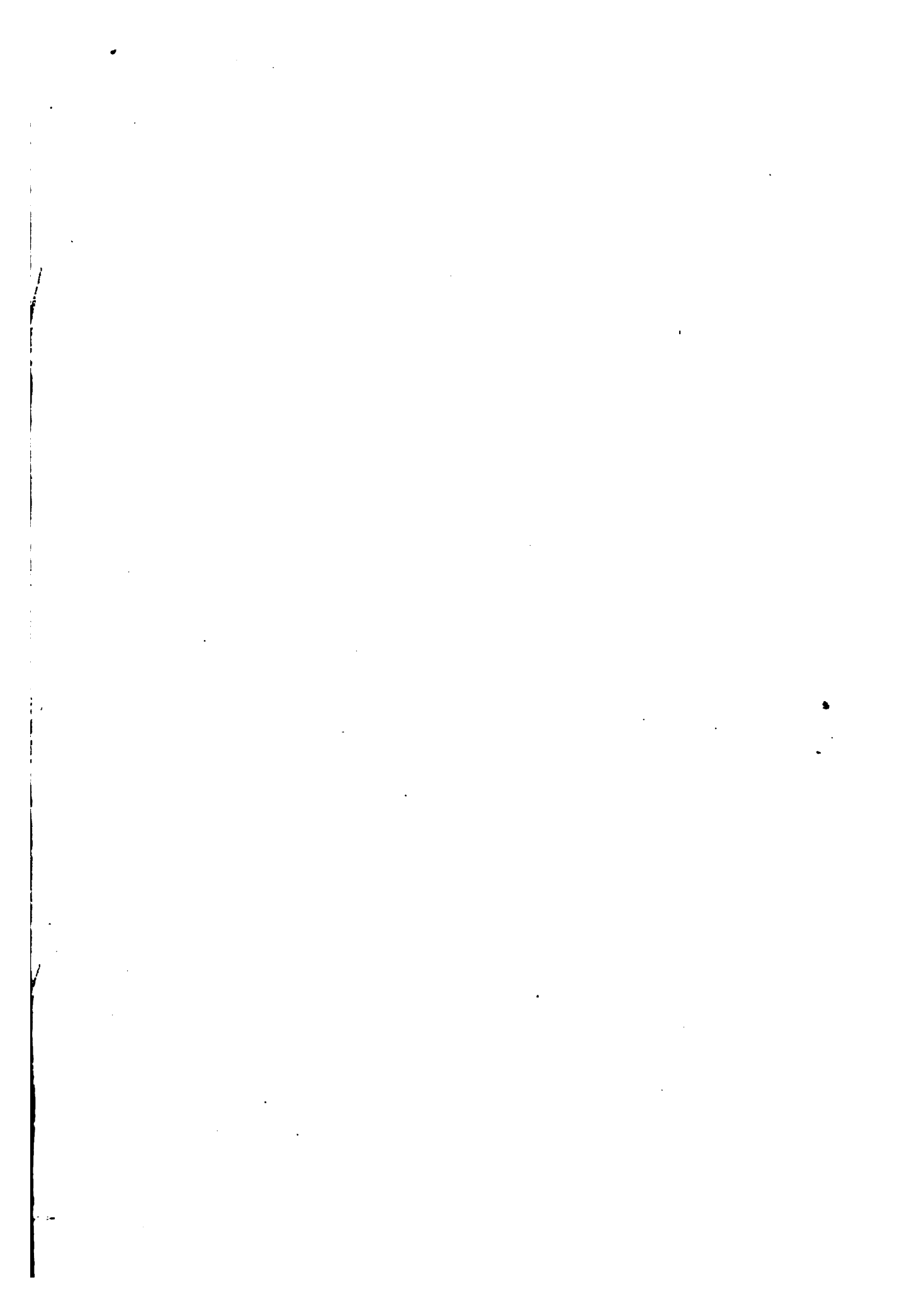
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C.A.CARRIGER

C.A.CARRIGER









CANNA LILY - 'FANTASY'

CANNAS

The beautiful race of Cannas that we now possess was originated by M. Crozy, a French nurseryman, who, by crossing two species, obtained a new "break" of comparatively dwarf habit and with large flowers. Other breeders, especially Herr Pfitzer and Herr Ernst, German nurserymen, have continued the work of improvement by cross-breeding and selection, with the result that a large number of beautiful varieties are now available for the garden, both under glass and in the open air in summer. In the warmer parts of this country Cannas are used as bedding plants; they are lifted in October and stored in a dry frost-proof place until March, when they are started in a little warmth with Dahlias, &c., and planted outside in June. They flower continuously from July onwards. Grown in pots under glass they form handsome pictures of large green or bronzed leaves and spikes of flowers, whose colours vary from rose to crimson, cream yellow to orange, or variegated, as in that shown in the plate.

THE
GARDENER'S ASSISTANT

A PRACTICAL AND SCIENTIFIC EXPOSITION OF THE
ART OF GARDENING IN ALL ITS BRANCHES

BY

ROBERT THOMPSON

OF THE ROYAL HORTICULTURAL SOCIETY'S GARDENS, CHISWICK

NEW EDITION

REVISED AND ENTIRELY REMODELLED UNDER THE DIRECTION
AND GENERAL EDITORSHIP OF

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ILLUSTRATED BY NUMEROUS ENGRAVINGS IN THE TEXT AND A
SERIES OF COLOURED PLATES

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COLOURED PLATES

CANNA KÖENIGIN CHARLOTTE.

GLOXINIAS.

LILAC—1, Alba Grandiflora; Souvenir de Louis Spath.



HIMALAYAN HOUSE AT KEW
(A Wing of the Great Winter Garden)

This conservatory (fig. 270) is constructed of wood, and is 30 feet long and 20 feet wide. There are gratings in the base for the admission of air in cold weather, so that it may pass in close to the hot-water pipes, and not in cold currents. Fig. 271 represents a handsome conservatory

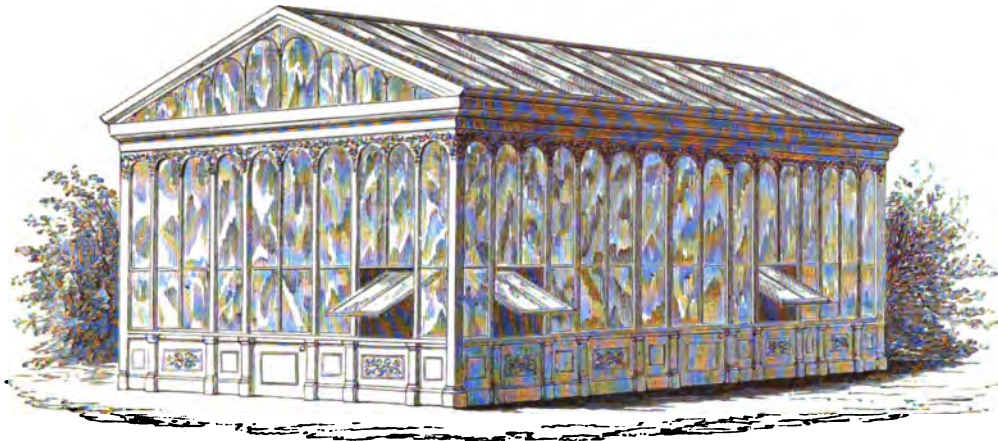


Fig. 270.—Conservatory.

built by Messrs. Mackenzie & Moncur in Sefton Park, Liverpool. It is of rolled-steel and glass, and is 110 feet in diameter by 70 feet in total height. It is elegant in design, and excellent as a house for the healthy growth of plants. *Hot-houses.*—These are structures in which

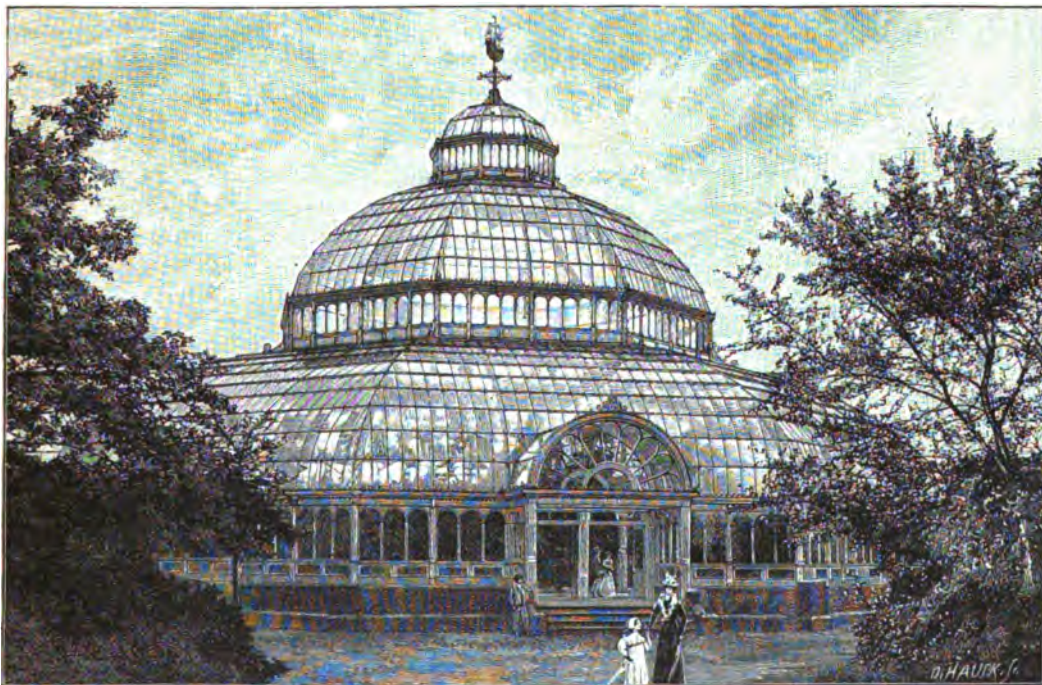


Fig. 271.—Conservatory, Sefton Park, Liverpool.

plants from the tropics are grown. The principles by which their construction should be regulated have reference to the three great agents of vegetation—heat, light, and moisture—principles which ought to be kept in view in the planning of all kinds of plant structures. The stove differs from the greenhouse chiefly as regards heat, for which in the former more ample provision requires to be made. It also differs in the mode of ventilation. A greenhouse may be made a stove by increasing the number of hot-water pipes. In the culture of

many plants for which the greenhouse is too cold, and the stove too hot, an intermediate house is desirable.

The largest glass structure devoted exclusively to plants is the Winter Garden at Kew, the dimensions of which are:—length, 628 feet; width, 164 feet; height (inside), 60 feet. The area covered by the whole structure is $1\frac{3}{4}$ acre. Its total cost was about £43,000. The largest or central portion was built in 1862, the south wing in 1897, and the north wing in 1899. This last, the Himalayan house, is represented in the Plate. It was built by Messrs. Mackenzie & Moncur, and its dimensions are:—length, 116 feet; width, 64 feet; height (inside), 38 feet. The entrance porch is 12 feet by 8 feet. The base and pillars are brick, the frame of the roof is rolled steel, the sashes being wood. It is an excellent house both architecturally and horticulturally. The inside is laid out in beds, and the whole of the plants are planted out, no pots or stages being used. This house is also remarkable in that no artificial heat is employed in it at any time of the year.

The glass houses which are found necessary in a garden establishment are sometimes collected into a range, as it is called, that is to say, several houses are grouped together in some favourable position. A plan of such a range will be found on page 211 (fig. 272). In certain cases, and not uncommonly, such ranges of houses consist of lean-to glass structures, built on the south side of a wall, the necessary garden offices, such as seed-room, fruit-room, mushroom-house, potting-sheds, and store-rooms generally being constructed on the north side of the wall. In other cases the ranges are detached, so as to gain various aspects for houses devoted to different purposes, and the offices are then grouped in some convenient contiguous spot provided in the original disposition of the ground. In all good modern gardens the young gardeners' apartments are separated from the offices, and form a separate structure.

It will thus be seen how easy it is to adapt a range of glass-houses to meet the requirements of any particular establishment. As a rule it may be assumed that a number of small and comparatively low houses are of more utility than a few larger ones. Indeed the only large houses, except those which, like conservatories, are built for display, are Vineries intended for main and late crops, and here an increased length of rafter, by giving more scope for the development of the Vine, is certainly beneficial. For the culture of Pines, early Grapes, Peaches, Figs, &c., amongst

fruits, and ornamental plants of all kinds, whether requiring a stove or greenhouse temperature, small houses are decidedly preferable to large ones.

The two ranges represented in the Plate are examples of the most modern structures for either a private garden or a nursery. The advantages of having the whole connected by means of a corridor, long lean-to, or even a large conservatory, are now generally recognized.

Wall-frames.—In the south of England wall-fruits, such as Peaches and Nectarines, ripen perfectly well without the aid of glass in ordinary seasons, the only protection required being that against late spring frosts; but in the northern parts of the kingdom more protection is requisite. Accordingly a wall is sometimes covered with glass, forming in fact a narrow house, which may be termed a *Wall-frame*, *Wall-case*, or *Fruit-preserver*; this serves to protect the blossoms, and to assist in ripening the fruit.

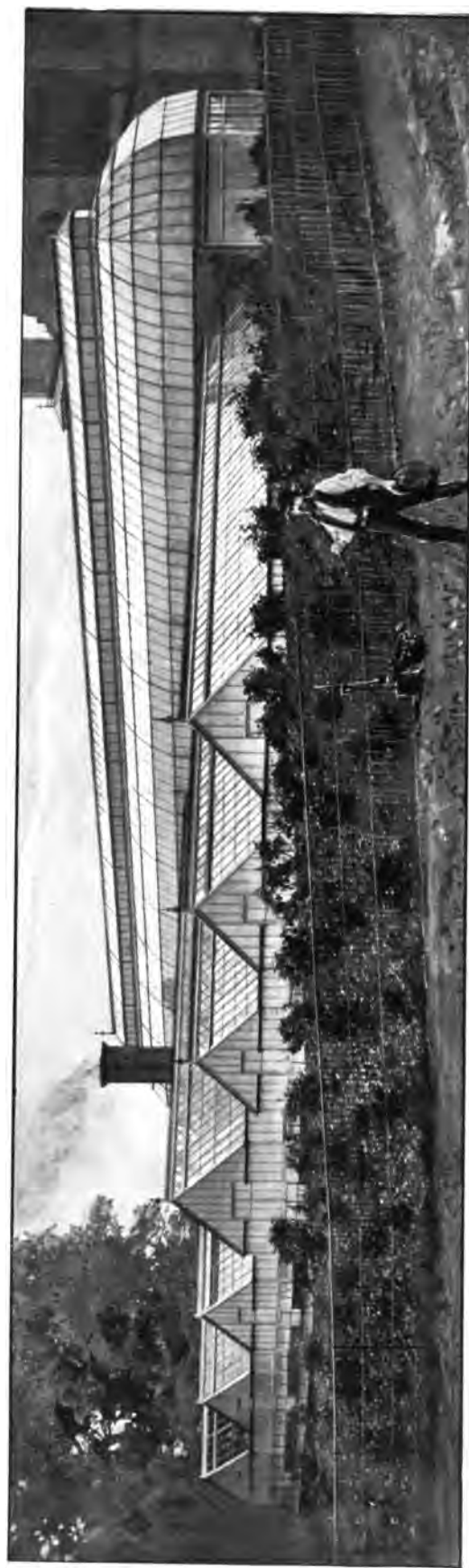
There are other ways in which wall-frames may be constructed, but some of them are more expensive than lean-to structures, of the character of which they more or less partake. When such expense is to be incurred, we think it would be well to incur still more, and have a command of heat sufficient at least to keep out frost during the spring months.

Horticultural buildings of every kind ought to be carefully painted every three years, and kept clean and in good repair. They are usually painted a light stone colour, and only genuine white-lead and linseed-oil paint of the best quality should be used.

III.—MISCELLANEOUS STRUCTURES.

Fruit-room.—The conditions necessary for keeping fruit well are a dry atmosphere and a cool steady temperature. To ensure these conditions as far as possible the room should be in a dry airy situation, and its exterior exposed to a free circulation of air; that it may have a cool temperature, the floor should have a circulation of air below it; and there should be the means of ventilation, but at the same time the doors and windows ought to fit closely in case of severe frost.

The earth at small depths has a temperature equal to the annual mean temperature of the air, which in Britain is between 46° and 50°. Now, if a room were built with double walls and roof over a portion of ground at 50°, and if the room were closely shut up when a thermometer indicated the air inside to be as low as



PLANT-HOUSE RANGES

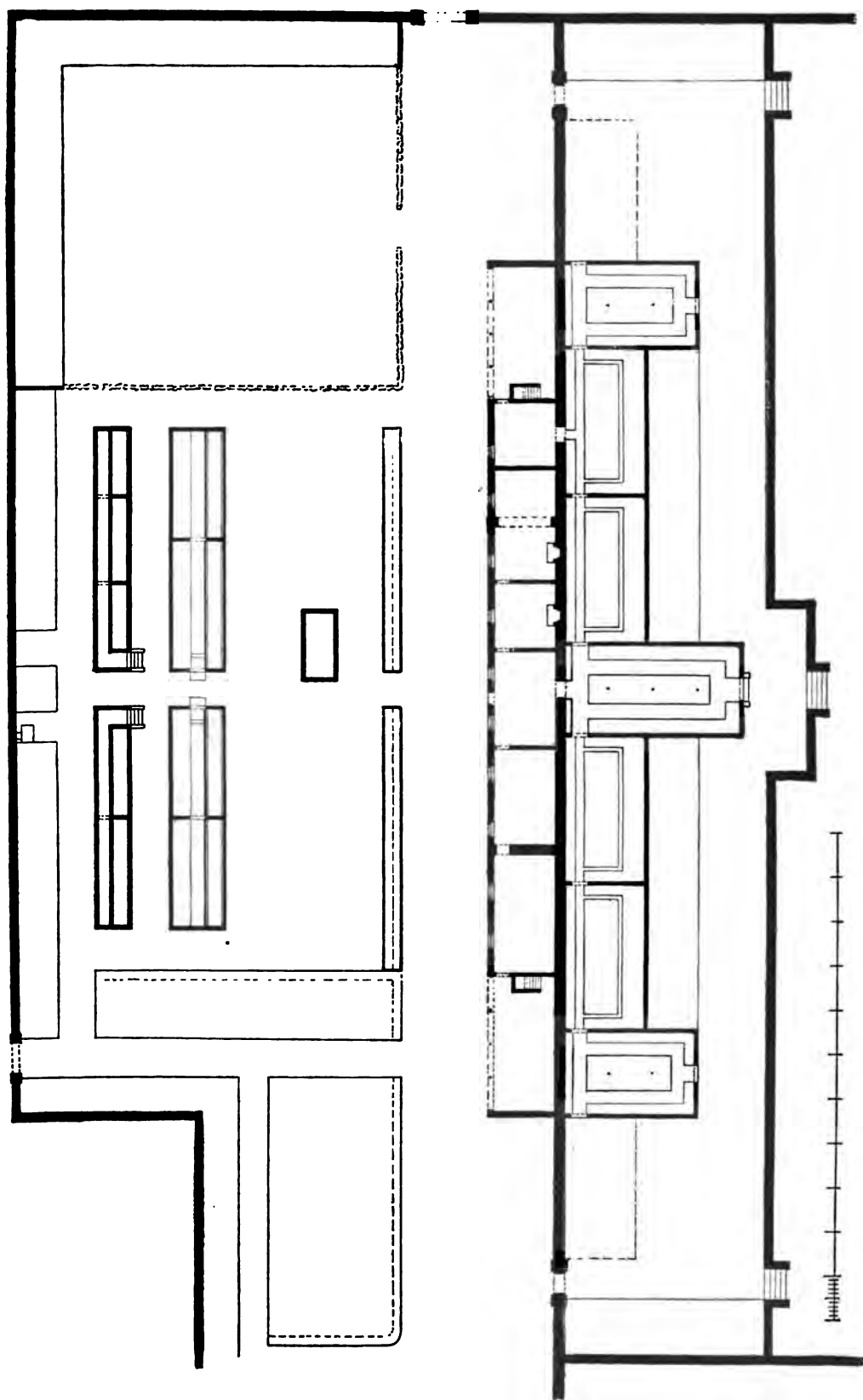


Fig. 272.—Ground Plan of Range of Plant-houses, Sheds, Frames, etc.

32°, although for a week the air outside might continue even colder than this, yet it would be found at the end of that period that the heat from the ground-floor would have warmed the internal air considerably above 32°. It is therefore a mistake to sink into the earth for coolness in winter. Of course, in summer, if the air were at say 80°, and the earth at 50°, the latter, instead of giving, would abstract heat from the air, and the apartment would be cooler than if built on the surface. But in order that the fruit-room may be cool in winter, it should be insulated as much as possible from the constant source of heat existing in the earth.

Vicissitudes of temperature have very injurious effects on the keeping of fruit. When fruit is warmer than the surrounding air it is liable to shrivel; when much colder, a deposition of dew takes place on its surface, just as a cold mirror becomes dimmed with dew when brought into a warm room. In the commencement of cold or frosty weather the fruit will be found dry, because warmer than the air; but when the thaw comes with comparatively warm south-west winds, the fruit will be found colder than the air, and covered with moisture. The alternate wetting and drying of the fruit, arising from vicissitudes of temperature, must be guarded against as much as possible, by endeavouring to maintain the greatest possible uniformity of temperature. The walls should therefore be hollow, and it has been shown that such can be built at less expense than solid ones. Fruit-rooms already constructed with solid walls ought to be lined with wood, leaving $\frac{1}{2}$ -inch cavity between the lining and wall; indeed a lining of this description is to be recommended whether the walls are hollow or not. The roof should have a double ceiling.

It has generally been considered that fruit keeps best in darkness, and some of the finest specimens of Apples and Pears which have been exhibited in the spring were so kept; on the other hand, equally good fruit has been shown that was kept exposed to light. It has been frequently observed, however, that the finest specimens of Apples and Pears, when placed opposite a window, soon acquire a much inferior appearance to that presented by those left in the dark, and it would therefore appear that full exposure to light is not favourable.

Fig. 273 is an interior view, and fig. 274 a section of a fruit-room which combines all these conditions. The construction of the room will be understood from the following explanation:—*a a*, shelves; *b*, close boarding round the sides

of the room; *c*, air-space between the boards and the wall. There is also an air-space on the north side, between the two plaster ceilings, as

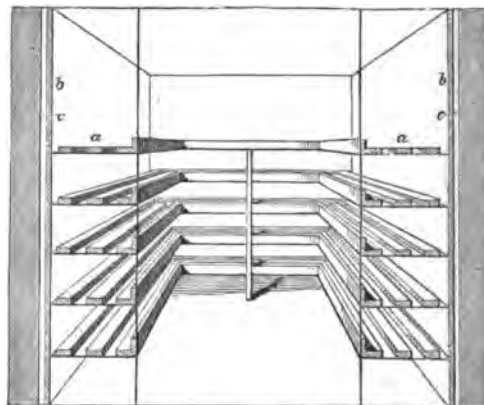


Fig. 273.—Fruit-room (interior view).

shown in fig. 274, in which *d* is a tove; *e*, a circular window hung on pivots, and fitted with a roller-blind; *f*, partitions of open work similar to the shelves. Such a room may be constructed

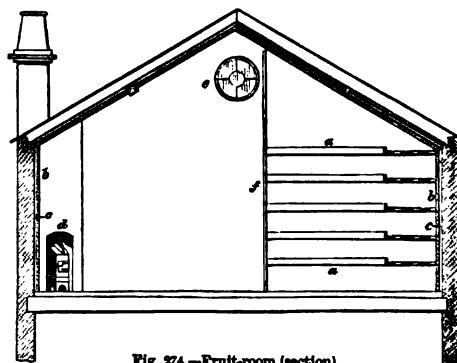


Fig. 274.—Fruit-room (section).

over a coach-house or other unheated structure, but for keeping the fruit in good condition for a long period it is better to build it on or slightly below the ground-level. The small stove need only be used when the temperature of the room falls below freezing, or on a dry day, in order to speedily remove any damp arising from the fruit, air being freely admitted by the side window at the same time. Whether open or shut, the window should be always covered with the roller-blind.

Mr. Rivers, who exhibited in the spring of 1869 a collection of Apples in admirable condition, both as regards appearance and flavour, thus describes the circumstances under which they were kept:—“My fruit-room was built in 1761 by my great-grandfather. It is an arched cellar, 40 feet long, 12 feet wide, and 7½ feet high. It was originally

a wine-cellar, but for many years has been used as a fruit-room. In the centre is a broad pathway, and on each side are shelves, on which the Apples and Pears are placed on the bare boards. It is ventilated by only one aperture, 3 feet by 2, in the wall at the north-west end, just under the crown of the arch. This aperture, which has an iron grating, has a shutter with which it is closed in very severe weather. This closing is, however, of rare occurrence, for the shutter has not been used to any extent either this or the past

winter. The perfect dryness of the cellar is owing to its having a range of packing sheds over it, so that the soil resting on the arch has become in the course of years a mass of earth dry as dust. The temperature of the place is most remarkable for its evenness, ranging from the middle of October till the middle of March from 45° to 47°, the former being the rate from the middle of November till the end of February, seldom varying half a degree. This low even temperature, with a supply of fresh air without

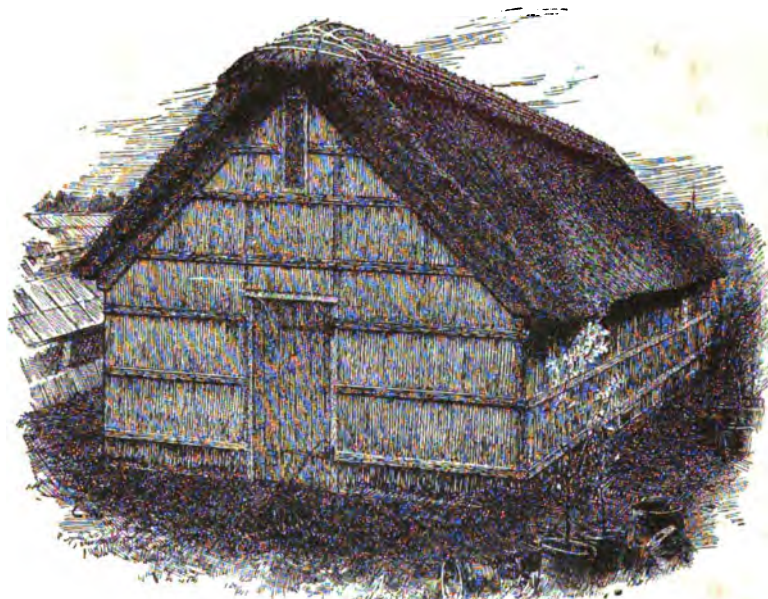


Fig. 275.—Bunyard's Fruit-room (exterior).

draughts, seems very favourable to the preservation of Apples and Pears; for early autumn Apples, such as the Hawthornden and several others, keep plump and sound till Christmas, and even later. To the feeling my fruit-room is agreeably warm in severe weather in winter, and agreeably cool in hot weather in summer."

A cheap and effective fruit-room for storing Apples and Pears has been devised by Mr. George Bunyard. A description and figure of it were published in the *Journal of the Royal Horticultural Society* (vol. xviii. 145), and the following particulars, furnished by Mr. Bunyard, were published in the *Kew Bulletin* in 1895:—

The fruit-room is 30 feet long by 12 feet wide, is capable of holding 300 bushels of fruits, and costs about £30.

Foundation.—First level the soil and dig out holes for the corners large enough to admit brick piers 14 by 14 inches, or stones about 1 foot square; fix an iron dowel in the centre

to receive the corner-posts of the structure. Some provision for air, such as air-bricks, or an aperture covered outside and inside with perforated zinc, should be provided just above the ground-line. If over 20 feet long an extra foundation should be put in at the half-distance.

Main Posts.—Make these 6 feet long, 6 inches square, and prepare a hole in the foot to receive the dowel mentioned above; this will keep the framework firm. The main ground-plate should be 4½ by 3 feet, and the top-plate of the same size; support and steady these in the usual way with quartering 4½ by 3 feet, and when fixed, choose a dry day to pitch, tar, or cold creosote the lower plates and all the woodwork 2 feet from the ground to protect from damp. The quartering should show an even outside face.

Outside Covering.—The cheapest material will be ¾-inch matchboard, and it may as well be fixed on the rafters as well. Pitchboard 4½ feet by 1; rafters 3 feet by 2.

Bonds from one side to the other should be $4\frac{1}{2}$ by 3 feet; if stout, they are useful to hold planks, on which baskets can be placed overhead in the roof. To receive the vertical thatch a side board is attached 6 inches wide from the ground to roof, in which the thatch is placed upright, and it is kept in position by lateral splints of wood 3 feet by 1, shown in engraving.

The thatch may be 18 inches thick on the roof and 6 inches at the sides, and where it can

be procured, carex or reed is strongest and most lasting, but it may be of wheat-straw or heather. The eaves should project a good way, to protect from damp.

Doors.—An inside and outside door should be provided. They must be made to fit closely, to exclude draughts.

Windows.—In order to allow of an inspection of the fruit, windows of 21-oz. glass are inserted, and this saves the use of a candle at storing-time, but outside shutters are provided to keep



Fig. 276.—Bunyard's Fruit-room (interior).

the place as dark as possible. A fruit-room is perhaps better without windows.

Ventilation is provided by an opening under the apex of the roof at each end, 1 inch by 9 inches, a small opening being left between the dairy shutters which can be stopped by hay or moss in severe weather. The inside should be protected by perforated zinc, fine enough to keep out wasps and flies.

Thieves and Rats.—In order to protect the contents, a half-inch stout wire netting should be fastened to the matchboard outside, so that an entry would be difficult. This is advisable also to keep out rats.

Inside shelves on which to lay the fruit are readily fixed at the sides; first place uprights 2 inches by $1\frac{1}{2}$ inch from the ground to the roof, and then attach bearers 2 feet by $\frac{3}{4}$ on this to the quartering. We find 1 foot between the shelves a very convenient distance. This places the lowest shelf 6 inches from the ground,

making six in all up to the eaves. The shelves are made of $\frac{3}{4}$ -inch matchboard, and need not quite meet each other, so as to allow a slight circulation of air. Upon these we place lengths of clean wheat-straw, so that the fruit shall not quite touch the shelves. In the centre of the fruit-room we have a narrow table with a raised edge, and made of three lengths wide of matchboard, set on trestles; this is useful for special sorts.

Names.—Get a slip of zinc 4 inches long, turn up one end 1 inch, at an angle of 45° , and then slit this angle three times and bend it so that it will hold a neat card; the other end can be slipped under the straw.

The fruit must never be wet when stored, and should be handled very carefully and laid singly on the shelves, but in the case of small Apples (Russets, &c.) they will keep well three or four thick. Carefully overlook from time to time and remove rotten or spotted fruit, and keep the floor always damp.

In this manner it is not difficult to keep late Pears until March, and Apples until May or June.

Ice-house.—The cheapness and convenience of artificially-made ice (it can be obtained delivered at a cost of one penny or less per pound) renders the comparatively expensive system of storing no longer necessary. Where, however, home-stored ice is preferred, it may be kept by either of the following methods:—

The design fig. 277, and of which fig. 278 is the ground-plan, of an American ice-house, is of



Fig. 277.—American Ice-house.

the most economical kind, yet sufficiently ornamental to make it an agreeable appendage to any family establishment. The size may be 12 feet square—less than that would be too small for keeping ice well—and from that up to any

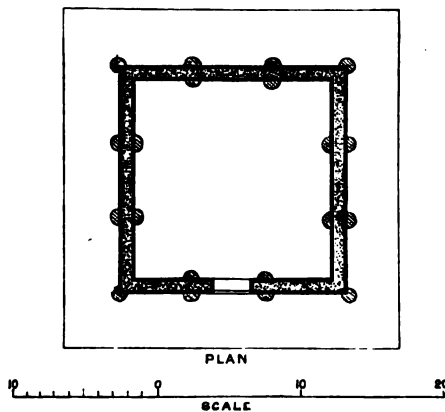


Fig. 278.—Plan of American Ice-house.

required extent. The idea here given is simply the principle of construction. The posts should be fully 8 feet high above the ground to where the plate of the roof is attached, and the house built thus:—

Mark out your ground the size you require for the house; then, commencing at one corner, dig opposite each other a double set of holes, 1 foot

deep and $2\frac{1}{2}$ feet apart, on each side of the intended building, say 3 feet equidistant, so that when the posts stand up they will present a double set $1\frac{1}{2}$ foot apart. Then set in your posts, which should be of some lasting wood, and pack the earth firmly around them. If the posts are sawed they may be 4 by 6 inches in diameter, set edgewise toward each other; or they may be round sticks cut from the woods, lined to a surface to receive the planking. Of course when the posts are set in the ground they are to show a skeleton of what the building is to be when completed. When this is done, square off the top of each post to a level all round; then frame or spike on to each line of posts a plate, say 6 inches wide and 4 to 6 inches deep, and stay the two plates together strongly, so as to form a double frame. Now plank or board up closely the inside of each line of posts, that the space between them shall be a fair surface. Cut out or leave out a space for a door, $2\frac{1}{2}$ or 3 feet wide and $6\frac{1}{2}$ feet high, and board up the inner partition sides of this opening, so as to form a door-casing on each side, that the space between the two lines of posts may be a continuous box all around. Then fill up the entire space between the posts with moist tan-bark or saw-dust, well packed from the ground up the plates; and the body of the house is inclosed, sun-proof and air-proof, to guard the ice.

Now lay down inside the building some sticks—not much matter what, so that they be level—and on them lay loose planks or boards for a floor. Cover this floor with a coating of straw 1 foot thick, and it is ready to receive the ice.

For the roof take common 3×4 joists as rafters, or in place of them poles from the woods, long enough in a pitch of full 35° to carry the roof at least 4 feet over the outside of the plates, and secure the rafters well to them by pins or spikes. Then board over and shingle it, leaving a small aperture at the top, through which run a pipe, say 8 inches in diameter (a stove-crock will do), for a ventilator. Then set in four little posts, say 2 feet high, as in the design; throw a little four-sided pointed cap on to the top of these posts, and the roof is done. To ornament the underside of the roof in a rude way, take some pieces of 3×4 scantling, such as were used for the roof, if the posts are of sawed stuff—if not, rough limbs of trees to match the rough posts—and fasten them to the posts and the underside of the roof, by way of brackets, as shown in the design.

When the ice is put in, a close floor of boards should be laid on joists which rest on the wall-

plates loosely, so that this upper floor can be removed when putting in the ice, and that being covered 5 or 6 inches deep with tan or saw-dust—straw will do if the other cannot be had—the inside arrangement is complete. Two doors should be attached to the opening where the ice is put in and taken out—one on the inner side of the lining and the other on the outside, both opening out. Tan, saw-dust, or straw should also be placed on the top of the ice when put in, so as to keep the air from it as much as possible; and as the ice is removed it will settle down upon, and still preserve it. Care must be taken to have a drain under the floor of the house to pass off the water which melts from the ice, as it would, if standing there, injure its keeping.

A much simpler method is that of building up a stack of large pieces of ice on a well-drained site under the shade of trees, and thickly thatching it over with wheat-straw. The stack should be made solid by filling in the spaces between the large pieces with finely-pounded ice. When properly stacked in this way, ice can be kept with little waste for a whole summer.

It may appear paradoxical, but the substances which are considered the warmest are the best for keeping ice from melting. If we fill a bottle with hot water, and wrap it in flannel, it will keep hot nearly twice as long as if the bottle had been freely exposed to the air, for wool, being a slow conductor, prevents the air from readily acquiring heat from the water. Suppose the bottle to be filled with ice, the same kind of woollen covering will prevent the ice from readily obtaining heat from the air, and consequently the former will be nearly twice as long in thawing.

In filling the house, the ice is generally broken, or somewhat pounded, in order that it may pack closer, but we have seen large masses put in without breaking; all cavities should, however, be filled with the fragments pounded, and the whole rendered compact by throwing water over the layers. In default of ice, the house may be filled with snow, well beaten, and watered, if not in a wet state; it answers very well, and may be kept a twelvemonth. Some use salt, but its utility is very doubtful, and according to others it is worse than useless. At all events, ice well insulated from earth and water, and shut out from the free access of hot air in summer, will keep very well without salt.

[J. B.]

CHAPTER XVIII.

HEATING.

BY FLUES—BY HOT WATER—FURNACES—BOILERS—
PIPES—WARMING BUILDINGS BY HOT WATER—
HEATING BY STEAM—HEATING BY GAS.

Heat has a constant tendency to equalize itself; hence when combustion ceases, the substances which have acquired an elevation of temperature begin to cool, their heat being communicated to other substances near them, and from these to others more and more remote, till at last the original intensity becomes as it were universally diffused. It may be communicated from one solid body to another, or it may be conveyed to a distance by air or water in motion.

By employing air or water as a vehicle for heat, we can convey it to a considerable distance from the fireplace, in either a perpendicular or horizontal direction, or in that of any upward incline, but not readily downwards, because gases and fluids become lighter when heated, and consequently ascend.

Of the two principal modes of warming horticultural structures by fire-heat, that by which air or other gas in motion is the vehicle or heat-carrier is the older; the other, by which water in motion is the medium of conveyance, is the more approved, and that which is now generally adopted.

Heating by Flues.—The flue is a channel commencing at the furnace, of which it may be said to be a continuation, and terminating in the chimney. It encloses the heated air and gases, conveying them generally along the front and then the back of the house, by which time most of their heat is imparted to the materials of the flue, and from these communicated to the air of the house.

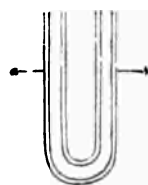


Fig. 279.

Although heating by hot water has superseded heating by flues, yet these, when well constructed, answered the purpose exceedingly well, as shown by the fine productions, both fruit and flowers, that have been obtained in houses thus heated.

Heating by Hot Water.—If a pipe, open at both ends, is bent in the form of a U (fig. 279), and water is poured in, it will stand at the same height in both legs, as at *a b*; but if the water is taken out of the leg *a*, and spirits of wine substituted, the water will fall below *b*, and the spirits of wine will rise above *a*, presuming that

the two liquids are kept separate; consequently the height of the two columns will be unequal, because the weights of the two liquids are unequal, the pure spirits of wine being, bulk for bulk, nearly one-fourth lighter. Now, although water of an equal temperature would stand at the same height, yet if cold water were put in the one leg and hot in the other the heights would be unequal, because cold water is heavier than hot; and although the greatest difference between the coldest and hottest water is less than that between water and spirits of wine, still it is sufficient to produce an inequality of pressure. If both legs were completely filled, and heat applied, say to the leg *a*, the water would overflow; but if the two legs were connected at top as well as at bottom, and one side were kept hot and the other cold, the water would constantly ascend in the warm leg and descend by the cold, and thus a circulation would be established.

The primary cause of the motion is the heat of the fire rendering the water in the boiler specifically lighter than that in the pipes; and when this effect takes place the law of gravity immediately comes into operation, so that the actions of flow and return are simultaneous. The greater the difference between the temperature of the water in the boiler and that in the return-pipe, the more rapid the circulation, and the converse.

Furnaces.—The best furnaces are those in which the fuel is most effectually consumed; it is scarcely necessary to mention that they should be adapted for a strong fire, in order to counteract intense frost; but they should also be constructed for slow burning when only a little heat is required.

The combustion of ordinary heating materials, it is well known, requires a certain amount of air. In furnaces this is usually supplied through the bars, and occasionally in part through the furnace-doors. Sufficient air should be admitted to supply the necessary amount of oxygen, without which the fuel would not burn; more than sufficient is injurious, for it robs the fire of a portion of its heat, and carries it up the chimney. It is therefore necessary to have the power of regulating the admission of air, and consequently that the furnace-door, as well as the ash-pit door, should fit perfectly. Hinged doors are used for small boilers, and sliding door-fronts for larger boilers. In fig. 280 the doors move on rollers on an iron rod. The frame of the opening projects a little outwards towards the base, so that the weight of the door partly rests upon it; and the more the door is

moved the closer it fits. By these doors the air can be regulated to a nicety; and a good stoker will soon find out how much opening he should allow. If he require much heat he must increase the quantity of fuel, and in proportion the supply

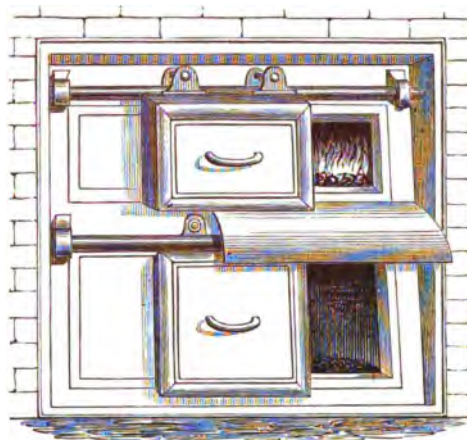


Fig. 280.—Sylvester's Furnace-doors.

of air. Once produced, the heat must distribute itself in some way, and the object to be attained is, to transfer as much of it as possible to the water in the boiler. The latter ought to be set so as not to obstruct combustion, and should have a large surface directly exposed to the radiation of the fire.

Boilers.—Of these there are many kinds, some of them very complicated; but of any two that may prove equally effective, the simpler form is to be preferred. We should be inclined to give the preference to the horse-shoe or saddle form of boiler, with a large surface for the fuel to act upon in a direct manner, and such, too, is the conclusion arrived at by most practical men after a long experience of boilers of different forms.

The plain Saddle-boiler is well known, and if properly set its working may always be safely depended on, though its action may not be so quick as that of some others. It may be safely used to heat up to 1000 feet of 4-inch piping, though from 750 feet upward the check end and flued saddle may be used in preference, as being more powerful in proportion to the size of furnace and fuel burnt.

There are numerous modifications of the saddle-boiler, and most of them are efficient.

One of the best is the Gold-medal Boiler, represented by figs. 281 and 282, and so called from its having gained the gold medal in the boiler contest at Birmingham in 1872. It is of wrought-iron, and has a water-way back; the

heat of the burning fuel strikes against this back before ascending into the centre flue, in passing through which it is diverted into flues right and left, and so on to the top of the boiler,

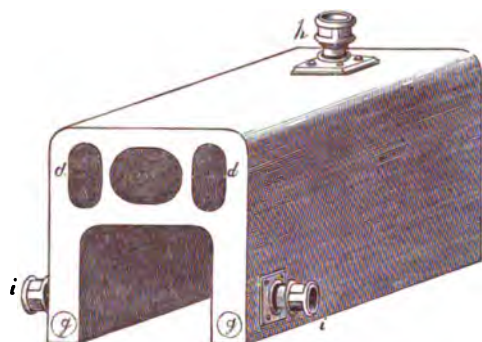


Fig. 281.—Gold-medal Boiler (elevation).

whence the smoke is conducted into the chimney-shaft, and by the time this is reached nearly all the heat is absorbed. This boiler is very durable, and is easily set, there being no com-

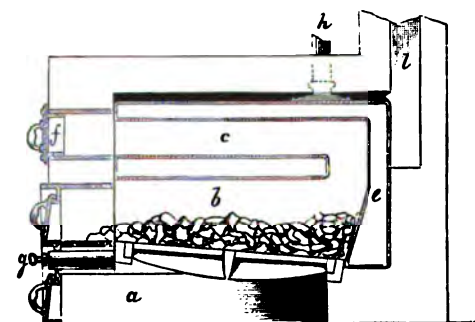


Fig. 282.—Gold-medal Boiler (longitudinal section).

plicated flues; and it will consume any kind of fuel. In the figures *a* shows the ash-pit, *b* the fire, *c* the centre flue, *d* the right and left return flues, *e* water-way end, *f* sliding soot-door for cleaning flues, with fire-brick casing, *g* sludge-plugs for cleaning interior of boiler, *h* flow-pipe, *i* return-pipes, *l* hollow space around the boiler for utilizing the heat given off by its exterior surface. This is virtually a flued saddle-boiler, of which there are many variations in use.

The Witley Court, Phoenix, Paragon, Allerton Priory, and Imperial are all improved saddle-boilers constructed mainly on the same principle as the Gold-medal here figured.

Stevens' Improved Cornish or Trentham Boiler (fig. 283) is another powerful form, not strictly speaking a saddle-boiler, being only a modification of the well-known Cornish steam-boiler. The great amount of work done by the latter with a small expenditure of fuel is a matter of

notoriety among engineers, and a proof of the soundness of its principle.

This boiler consists of two wrought-iron cylinders welded together in a very substantial manner, having about 3 inches of water space between the cylinders, and the door-frame being firmly attached at the end. The boiler is carried by two cast-iron chairs, shown at *a, a*, the front chair forming the frame for the lower flue-doors; these doors, *b, b*, fasten by a simple catch, and can be lifted off for sweeping, cleaning, &c., with the greatest facility. At the bottom is a plug, *c*, which should be unscrewed, and all accumulations of dirt thoroughly raked out of the interior, once in three or six months, according to the tendency of the water to deposit solid matter. The furnace doors, one of which is open, are shown at *d, d*, while *e* is the flow-pipe and *f* the return-pipe. In setting, the chairs are placed on a level foundation, and two solid brick walls built so as to clear the boiler, are carried up to about half the depth of the cylinder; here a course of fire-brick lumps is worked on and brought up close to the side of the cylinder, and resting on these an arch is turned over the top, leaving a narrow space about as deep as the top flue-doors, to serve as an upper flue, while the space below the fire-brick forms a lower flue. The grate bars are inside the cylinder towards the lower part, the space beneath them thus forming the ash-pit, and that above them the furnace. The heat therefore passes through the centre of the boiler first, then returns over its upper half, and finally is conducted under the lower half on its way to the chimney-shaft, which mode of setting is found to give better results than when the heat is first conducted below the boiler. The principle of this boiler is such as not only

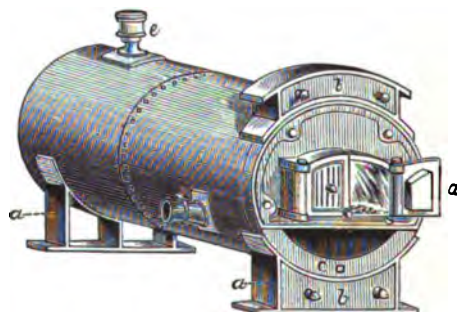


Fig. 283.—Stevens' Improved Cornish Boiler.

to expose a large area of water space to the direct action of the fire, but the heat operates with its greatest force on the upper part of the

boiler, where there is no possibility of solid matter accumulating to cause the iron to burn, and thus destroy the boiler. This boiler is preferable to others when anthracite coal is the fuel used.

What are called tubular boilers have been much patronized by horticulturists; they are no

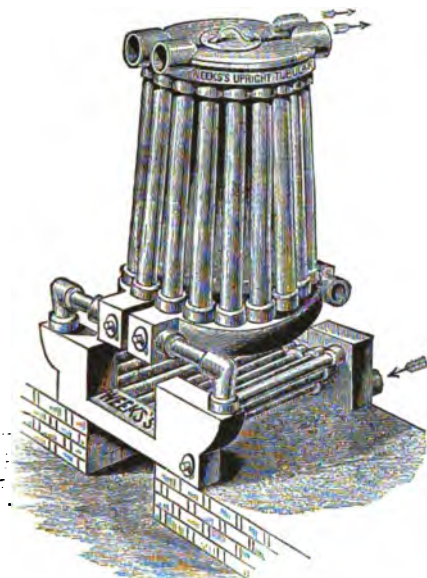


Fig. 284.—Weeks's Duplex Upright Tubular Boiler.

doubt both powerful and rapid in their action, but they are liable to crack from unequal casting when cast in one piece, and to leak from defective joints when made up of many separate parts. In order to meet these objections Messrs. Weeks & Co., of Chelsea, have provided the Duplex Upright Tubular Boiler, represented by fig. 284, the leading principle of which is that it is made up of two equal parts, which in ordinary cases can be worked as one, and in case of any accidental defect becoming manifest can be at once separated into two, the one half carrying on the work while the other is being repaired. The duplex boiler is made in two sections, each of which consists of the following parts—the upright tubes forming the boiler proper; the horizontal tubes forming the furnace; the diaphragm, by which perfect combustion of the fuel is obtained; the flow-pipe; the return-pipe. These parts being in duplicate, the one half, if need be, can be removed for repairs while the other is left standing in full working order.

Upright tubular boilers are not suited for common coal, as the products of combustion and the coal-tar and other matters which distil

from the fuel without being consumed, condense upon the tubes if a brisk fire is not kept up; and if these be at too low a temperature to burn them off, the ashes adhere, and so choke the furnace. Coke is preferable, though not indispensable, for the effective working of such boilers.

Fig. 285 represents another type of boiler, which appears to be constructed on sound principles. It is called the Centrifugal Boiler, and is invented and constructed by Mr. Deards, of Harlow. It consists of a continuous coil of pipes, constructed of half-circles turned and faced to form a true joint, and held together by clips and screws cast on the pipes. The base of the coil rests on the furnace bars, so that the fire is in the centre, and by an ingenious arrangement of flues, formed by iron plates built into the brickwork, is forced to act upon each separate coil. The upper end is the flow-pipe, along which the heated water travels; and the lower end forms the return-pipe, by which the cooled water is brought back to be reheated. There is provision made for cleaning the flues, and a

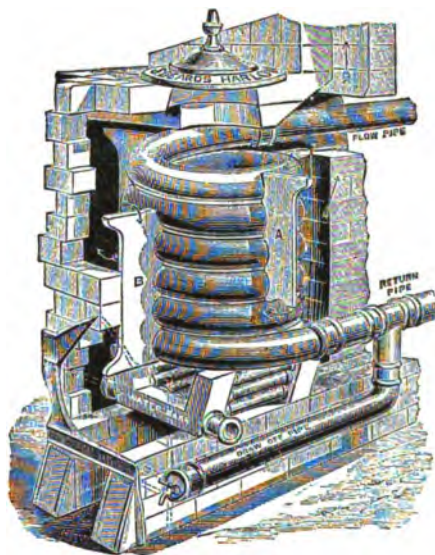


Fig. 285.—Deards' Centrifugal Boiler.

T-pipe with tap is inserted near the base of the boiler to remove sediment.

The Rochford Horizontal Tubular Boiler (fig. 286) is much in favour with market growers, and is also in use in private gardens, where a powerful and economical boiler is needed. Its essential feature is that the flues are in a direct line to the smoke shaft, ensuring perfect combustion and a quick draught, whilst the heat is all absorbed by the extension of the boiler-pipes

behind the furnace. Another important feature is its cheapness compared with other boilers, a time, whereas a boiler of the ordinary type having once given way is practically irreparable.

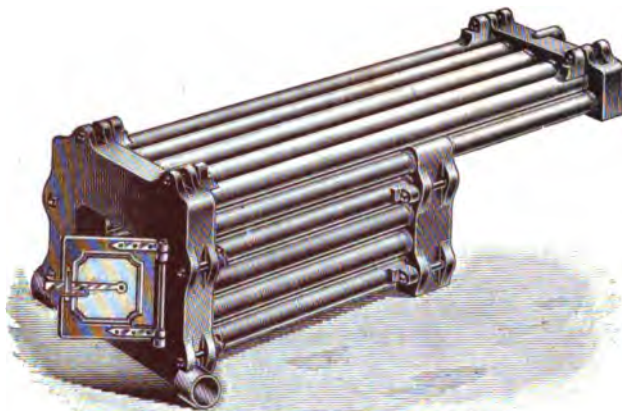


Fig. 286. — Rochford Horizontal Tubular Boiler.

Rochford boiler 9 feet 6 inches in length being sufficient to heat 2000 feet of 4-inch pipe, the



Fig. 287.

cost of boiler with fittings being about £20. Being of cast-iron it is very durable; it is easily

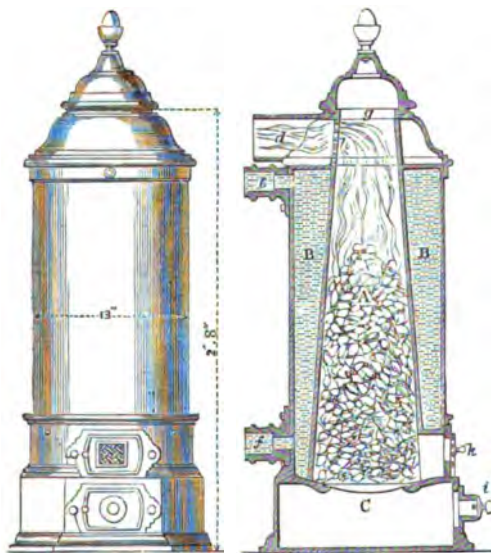


Fig. 288. — Portable Boiler and Furnace.

A. Inner tube for fuel. B. Wrought welded Boiler. C. Ash-box. D. Round smoke-flue. E, F. Flow and return pipes. G. Sand rim and cover. H. Cast-iron hopper. I. Ash-door and ventilator. K. Fire-door.

worked, and, in the event of a tube giving way, a new one can be substituted in a very short

The pipes fixed over the furnace in all the different types of the "Rochford" boilers are so placed that the space between the lower two is covered by the pipe above, so there is no fear of the fire missing any part. Fig. 287 shows how the joint between the pipe and casting is made.

The Portable Boiler and Furnace, represented at fig. 288, is intended for heating small structures. It requires no brick-setting, has a neat appearance, and may be placed in a small shed or cellar adjoining the conservatory, the smoke being carried outside by the flue *d*. It is very rapid in its action, and does not easily get out of order.

Another portable boiler is Deards' Amateur Champion Heating Apparatus, represented at fig. 289. It is a slow-combustion stove, containing a coiled pipe boiler similar in principle to the centrifugal boiler already noticed. It requires no fixing, being simply placed on a



Fig. 289. — Deards' Amateur's Champion Heating Apparatus.

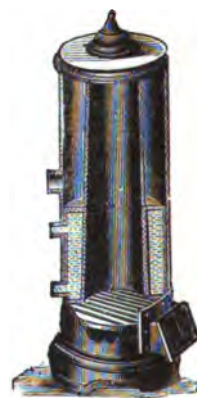


Fig. 290. — The "Manchester" Boiler.

stand of bricks. The body of the stove to contain fuel is seen at *a*, *b* represents the stoking door, *c* the ash-pit door, *d* the chimney, and *e* the supply-pipe, the lower end of which is fitted into a small pipe provided with tap for emptying and cleaning the interior; *f* is the flow and *g* the return pipe. For temporary purposes, or to meet an emergency, such as a breakdown in the permanent boiler, this is a most useful boiler.

Small Boilers.—Other small boilers made for heating small houses or frames are the Im-

proved Conical, the Independent Dome-top Cylindrical, the Manchester (fig. 290), and the Star Independent. These vary in height and heating power, but one 4 feet in height will heat about 1000 feet of 2-inch pipe. For still

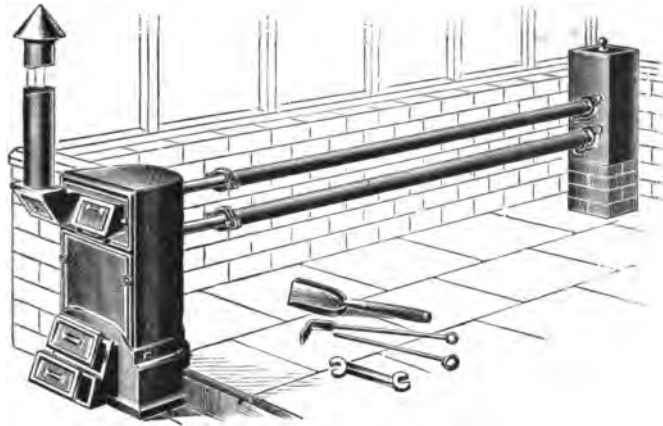


Fig. 291.—The "Halifax" Boiler.

smaller houses the Halifax (fig. 291) is a useful little boiler.

For the setting of hot-water boilers fire-bricks only should be used, and no stone or iron should be exposed to the fire except the parts containing water, for they will soon burn away, especially if coke is used as fuel. Fire-bricks not only do not burn out so rapidly as common bricks, but they economize fuel.

Pipes are generally made of cast-iron, but other materials are sometimes employed. Copper pipes are much used in France, and they have the advantage of heating quicker than those of cast-iron; but, on the other hand, they sooner become cold if the fire is not kept up, and this is often a disadvantage. The usual diameter of pipes is 4 inches, and this being found to be the most convenient and efficient size, calculations for length of pipe are usually made according to that diameter. In the case of small structures 2-inch and 3-inch pipes are preferable on account of their occupying less space.

The pipes, whatever may be their size and form, should be of uniform bore or capacity; and where valves are employed, they should be so constructed as to afford at pleasure a clear water-way equal to that of the pipes. Contractions and bends tend to obstruct the circulation; the former may be avoided, and of the latter there should be as few as possible. It is necessary that a small tube be inserted at the highest part of the flow-pipe, in order to provide for the escape of any air which may collect at that point.

To allow for expansion and contraction, the pipes should be slung or otherwise supported in a manner that will permit them to accommodate themselves to these forces. According to the experiments of General Roy cast-iron expands $\frac{1}{800}$ between the freezing and boiling points of water, or about $1\frac{1}{2}$ inch in 100 feet.

With regard to the joints of pipes, some prefer those which are flanged and screwed together with vulcanized india-rubber washers; others prefer socket-joints. The latter occupy less space, the former can be more easily removed and replaced. Except near the fire, socket-joints need not be put together with iron cement, especially when the circulation is carried on nearly on a level. When well caulked with rope and a mixture

of red and white lead, we have not in many years observed a single failure. By kindling a fire under the joints secured in this way, the pipes, if wanted elsewhere, can be separated without breakage, which can rarely be done when iron cement has been employed.

The quantity of pipe requisite for heating a house depends on the size and form of the house, the extent of the surface of glass, and whether the roof is of iron and glass, or of wood and glass, and the temperature required.

Warming Buildings by Hot Water.—Mr. Hood calculates the quantity of air to be warmed per minute at $1\frac{1}{2}$ cubic foot for each square foot of glass, deducting, as a general rule, $\frac{1}{3}$ for wood-work; and he gives the following rule for ascertaining the length of pipe which will be necessary for warming any given quantity of air:—"Multiply 125 by the difference between the temperature at which the room [or hot-house] is purposed to be kept when at its maximum, and the temperature of the external air, and divide this product by the difference between the temperature of the pipes and the proposed temperature of the room; then the quotient thus obtained, when multiplied by the number of cubic feet of air to be warmed *per minute*, and this product divided by 222, will give the number of feet in length, of pipe 4 inches diameter, which will produce the desired effect."

He gives the following table, showing the length of 4-inch pipe needed to heat 1000 cubic feet of air per minute to from 45° to 90° , the temperature of the pipe being 200° :—

Temperature of External Air.	Temperature at which the House is to be kept.									
	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°
	Number of Feet of 4-inch Pipe.									
10°	126	150	174	200	229	259	292	328	367	408
20	91	112	135	160	187	216	247	281	318	358
30	64	75	97	120	145	173	202	234	269	307
32	47	67	89	112	137	164	193	225	259	296
40	18	37	58	80	104	129	157	187	220	255
50	19	40	62	86	112	140	171	204

Pipes heated to 200° are likely to do harm in a plant-house, and we should recommend half as much piping again as that given in this table.

Heating by Steam.—This mode of heating is now entirely superseded in this country by that of hot water, which is cheaper, more easily managed, and can readily be applied on a small scale. It is very largely employed in horticulture in the United States of America, where, owing to sudden changes in the external temperature, it is necessary that the artificial heat should be easily controlled. The steam apparatus is so contrived that the pipes can be made quite hot in a few minutes, and as quickly cooled by letting out the steam. Pipes can be heated by steam to a much higher degree than by hot water, unless the latter is kept under pressure, but an intensely heated surface renders the air less favourable to the growth of plants than one which is only heated to 150°, and without exceeding this temperature we can get from an easily-managed apparatus as much heat as is desirable.

Heating by Gas is a convenient and cleanly mode of preventing injury from frost in small structures, such as greenhouses and conservatories attached to suburban residences; and if the products of the combustion of the gas be prevented from escaping into the house, the plants growing in it are in no more danger of injury than where any other mode of heating is employed. Various methods of heating by gas have been devised, water being generally the medium of conveying the heat. One of the best is that patented by Mr. G. Shrewsbury, of Lower Norwood, and which is made of various sizes. Fig. 292 shows one adapted for heating a small conservatory, the length of pipe necessary being of course regulated by the size of the house.

The apparatus consists of a cylindrical boiler with flow and return pipes communicating with a pedestal tank. Through the boiler run several tubes, wide below and contracted above, and directly under these tubes are placed the burners, which are constructed on the principle of

the Bunsen burner, and are screwed into a flat gas-tight box connected with the supply-pipe. The object of the gas-box is to secure an equal supply of gas to all the burners, and the box is made to swing out of the door of the outer case for convenience of lighting. When the gas is once alight the apparatus maintains a steady heat, and requires no attention beyond from time to time putting a small quantity of water into the feed-cistern to supply any loss that may have taken place. Mr. Shrewsbury states that about a pint a week is enough, but much would depend on the size of the boiler, the heat at which the water is kept, and other circumstances. If a down-draught can be guarded against, the apparatus may be fixed inside a conservatory

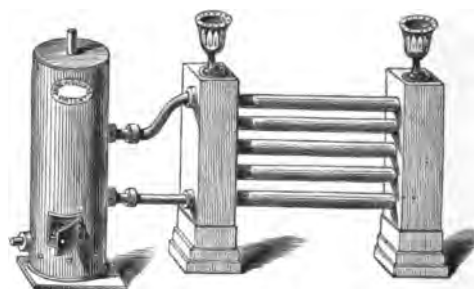


Fig. 292.—Shrewsbury's Gas-stove.

without any risk to the plants. No smoke is emitted from the burner, for the products of combustion being a light vapour, are carried off through an escape-pipe from the top of the boiler. But to render these apparatus suitable for all circumstances, they are made so that the pipes can be fixed inside the house, and the boiler on the outside or beneath, as convenience may allow. If the former, the boiler requires a wood casing to protect it from the inclemency of the weather. Modifications of this apparatus have been attached to large oil lamps such as Clarke's Patent Syphon, Rippingille's Patent, &c. One great advantage of using oil- or gas-heated boilers for small greenhouses or conservatories is, that those whose other avocations preclude their attending to fires in the day can leave them burning during severe frost. Small greenhouses attached to a dwelling-house can be heated from the boiler attached to a cooking range or kitchener. [J. B.]

CHAPTER XIX.

PROPAGATION.

PROPAGATION BY SEED—BY BULBS, CORMS, AND TUBERS
—BY DIVISION—BY RUNNERS—BY SUCKERS—BY
LAYERS—BY CUTTINGS—BY LEAVES—BY ROOTS—BY
GRAFTING—BY BUDDING—BY INARCHING.

Plants are propagated either from seeds, bulbs, tubers, runners, offsets, suckers, layers, cuttings of stems, roots, or leaves, and by grafting, inarching, and budding.

I.—PROPAGATION BY SEED.

This is the most natural mode of reproduction, and the one which is common to almost all plants in their natural state. It is from the seed that the most healthy and vigorous plants are produced, and, generally speaking, it is the most advantageous mode of propagation. Those characteristics which cultivators are most interested in, such as colour, size, form, &c., are not always reproduced in the seedlings, especially of those plants which have been modified by cultivation. For instance, the seeds of Ribston Pippin Apple, Gloire de Dijon Rose, and Mrs. Pollock Pelargonium could not be relied upon to reproduce the peculiar characters of the parents. Only those plants whose characters are fixed, and that can be propagated from seeds, are to be relied upon to come true.

In this country the seeds of the native vegetation generally ripen in autumn, but in most cases germination does not take place till spring; yet they mostly fall from the plant in autumn, for were they to hang on, most of them would be injured by being alternately wet and dry, and by exposure to frost. "By an admirable provision of nature, the seeds of our largest trees, as the Oak, Beech, and Chestnut, drop before the fall of the leaves, which then cover them to the depth of some inches. The leaves decay in the course of the winter, and form towards spring a light covering of leaf-mould, highly favourable to vegetation. Small seeds, such as those of the Lime and Ash, do not begin to drop till after the leaves have commenced to fall, and are thus placed at a less depth." From this it may be concluded that seeds have under purely natural conditions a light covering previous to germination. Although the Oak thrives well in strong deep loam, yet, self-sown, the acorns are placed amongst leaf-mould. Hence it may be inferred, that the soil best adapted for the growth of a plant is not always that which should be selected

for the seeds to be sown in, and that all except large seeds are best sown in fine, light soil, easily permeable to the young roots as well as to the plumule. Large seeds should not be buried much below the surface, whilst small seeds should be covered one-tenth of an inch, and the depth of covering should be increased somewhat in proportion to the size of the seeds. Those of the Bean and Oak may be 2 inches deep, the Walnut and Chestnut 3 inches. Seeds sown out-of-doors often require to be buried deeper than is necessary for germination, to protect them from vermin, &c. A good general rule is to bury all seeds to the depth of their smallest diameter. Thus, some Palm seeds should be an inch below the surface, whilst Begonia, Gloxinia, and other very small seeds should not be covered.

For successful propagation by seeds several conditions are necessary:—1. That the seeds have been perfectly ripened. 2. That they have been properly kept till the period of sowing. 3. That they be sown at the proper time. 4. That the sowing be performed in the proper manner.

1. *Perfection and Maturity of Seeds.*—The perfection and maturity of seeds can be generally determined by their external and internal appearance, and in many cases by their specific gravity, their sinking or swimming in water being frequently a good test. Except for convenience it is never advisable to keep seeds dry for a long time. Most seeds germinate readily if sown as soon as ripe; indeed some, such as those of Primulas and Hellebores, are best gathered and sown before they become quite ripe. The seeds of Cyclamen, if sown when fresh, germinate in a few weeks, but if allowed to get dry and hard, they sometimes fail altogether. It is not wise to allow choice plants to bear large crops of seeds. If the seeds have a plump appearance and clear colour, it may be presumed that they are good. If, in a fair sample, the section present a substance of the natural colour, and the rudiments of the radicle be perfect, there is every probability that the stock will germinate under favourable circumstances. Seeds of a plant that sink in water when good are of very doubtful quality when they swim; although in some cases they may grow, and especially when they float at first, but after having been moistened some time, either sink to the bottom, or only below the surface. The microscope in skilful hands will detect perfections and imperfections imperceptible to the naked eye. But of all others, the surest test is to sow a small quantity under favourable circumstances, and the proportion

that the number of the seeds which germinate bears to the number sown, will afford the most positive proof of the quality of seed. A quick mode of accelerating the vegetation of the seeds, for the purpose of trial, is to sow in a pot, cover them with nearly $\frac{1}{2}$ inch of soil, and plunge the pot in hot stable-dung. The covering of soil is made thicker than necessary for the seed when sown for a crop, in order to protect it from the direct action of the steam from the dung.

2. *Preserving Seeds.*—Seeds may be perfect, but if badly stored their germinating powers may become impaired or totally destroyed before the period at which they can be sown arrives. Canvas bags, of greater or less thickness and fineness, are found to keep large seeds exceedingly well; as all the Brassica tribe, Peas, Beans, and, in short, most kitchen-garden seeds. For all small seeds, however, paper is preferable, as it is closer in texture and does not so readily permit the essential qualities of the seeds to escape by exhalation. Nymphaea seeds should be stored in paper envelopes. Those of the *Victoria regia* must be kept in water.

The place in which seeds are kept should be so situated and arranged as to be as little as possible affected by changes of temperature. A cool temperature is best for not exciting the vegetative principle in seeds from plants of temperate climates, and consequently the best for their preservation; yet it should never fall below freezing—in fact near, but not lower than, 40° is probably the minimum which is most desirable. It should be possible to exclude the air when too cold; and if the internal air be too damp, the first opportunity should be taken to induce a free circulation of air when it is in a dry state. The floor of the seed-room should be boarded and dry; or, if of large dimensions, Portland cement may be employed.

Seeds generally may be kept in a wooden box in an ordinary dwelling-room, where they will be preserved from mice and damp and where the temperature is equable and moderate. The practice, too common in small gardens, of keeping the seeds in a box in a tool or potting shed, is not to be commended. Some tree seeds, such as Oaks and Chestnuts, soon lose their vitality if kept dry. The best mode of preserving them is to pack them in slightly moist sand, or in tolerably dry loam, and keep them in a cool place till spring; but when about to be sown, care must be taken to cover them immediately, so that they may not be exposed to the effects of the sun's rays, or to drought. Seeds of this description are sometimes packed

in clay, cow-manure, or damp sphagnum moss. The latter substance, growing abundantly in many woods, doubtless forms a natural protection to seeds that drop amongst it, for it retains a certain degree of moisture without being saturated, whilst it resists the vicissitudes of heat and cold, and is not apt to go into a state of fermentation. Acorns can be sent long distances if packed in moist soil or cocoa-nut fibre, or even in a cask with water. Large quantities have thus been sent from Kew to different parts of Africa, Ceylon, New Zealand, &c. Seeds of the Brazil-nut purchased in Covent Garden market were successfully sent to Brisbane in the same way. With the exception of the comparatively few kinds of seeds which soon lose their vitality if exposed to the air, all seeds travel best when packed in canvas bags or wooden boxes and sent dry. Hermetically-sealed tins and bottles are not to be recommended. In the latter case, the air in the jar or bottle becomes more or less saturated with the moisture they contain. The consequence is, that the seeds are then in an impure, damp, close atmosphere, and in most cases become completely spoiled.

3. *Time of Sowing.*—The most favourable time for sowing all seeds indigenous to any country is when they naturally drop from the plants. This rule, however, is not of general application as regards seeds of plants that are natives of a country having a very different climate from that of any other part of the world where they are to be sown. Favoured by mild weather, seeds of exotics may vegetate in autumn, and grow slowly yet safely through the winter; but in many cases the same kinds of plants, if raised in autumn in a climate like that of Britain, would perish during the winter; whereas, if the seeds are properly stored, and not sown till spring, the young plants will thrive as the weather becomes more favourable.

The time when seeds are self-sown in nature is doubtless the most proper for propagating the species with the greatest certainty in the absence of cultivation, and if no other object were in view, the cultivator might closely imitate nature as to the period of sowing, but he has other motives which render it often necessary to deviate from the natural mode. He has to cultivate the plant, not solely for reproduction, but also for its use or for ornament; and in either case he has to afford a supply to suit the demand, sometimes throughout the year, often for a considerable portion of it. These remarks chiefly apply to such plants as are of an herbaceous nature, and more espe-

cially to annuals and biennials. With regard to trees and shrubs, it is, generally speaking, well to adopt the natural period of sowing if circumstances will permit. At the same time it is desirable that the seedlings should make their appearance at the season which is favourable to their growth. Accordingly those seeds which do not keep well dry are committed to the soil, or mixed with it, in autumn, but their vegetation is not encouraged till spring.

In nurseries where large quantities of these seeds are annually sown they are treated as follows: A heap of fine soil is prepared, and the seeds are thoroughly mixed with it. The whole is then heaped up in the form of a cone and allowed to remain thus for a year, when the cone is broken up, and the seeds sown in the ordinary way. This treatment hastens germination, and preserves the seeds from vermin and bad weather, to which it would fall a prey if sown in the usual way.

The 'rot heap' is another method of hastening the germination of seeds, which, sown in the ground in the ordinary manner, would lie for years perhaps before germinating. The seeds are thoroughly soaked in hot water, and then mixed with sand or light soil. The whole is then buried in the ground, where the seeds will keep moist, and they remain there twelve months, when they are taken up and sown in beds in the ordinary way. Thus treated, the seeds germinate in a few weeks after they are finally sown. The seeds for which this process is employed are those of *Cratægus*, *Juniperus*, *Taxus*, *Cotoneaster*, *Plum*, *Pear*, *Rose*, and *Holly*, the seeds of which have a hard, bony testa.

Temperature has much to do with the length of time that seeds require to vegetate and appear above-ground. The seeds of Apples and Pears, if sown without any previous preparation, do not rise till the second year; but if previously washed, in order to remove a sort of mucilage which surrounds them and seems to be impenetrable to the action of the air and moisture, they then rise very well in the first year. In the same way many seeds that do not rise till the second year, if steeped for twenty-four hours, then rubbed slightly, and sown in heat, will rise the same year. The seeds of Pears thus treated have been raised in seventeen days, and the seed of Grapes in a month. Seeds of choice or new plants of which a stock is required as speedily as possible should be sown in warmth, and in this way much time is gained. Thus, *Rhododendrons*, *Roses*, *Conifers*, *Leguminous*

trees and shrubs, are rapidly propagated by this means. Care is necessary in hardening them off so that the forcing treatment shall not have a weakening effect upon the seedlings.

Herr Max Leichtlin, one of the most successful growers and propagators of hardy plants, writing in 1891 said: "If practicable, it would be best to sow all seeds of hardy plants at once when ripe; we only delay sowing for the sake of convenience, because we should, in the case of autumnal sowings, be obliged to house a very large number of pans and boxes of young plants too small to pass the winter outside. Hard-shelled seeds must be sown at once, also all seeds of hardy bulbous plants. If seeds of *Colchicum* be exposed to the air for a few days, not more than five per cent come up within a year, and the rest may take five years to germinate, whereas, sown as soon as the seed-pod splits, thirty per cent will germinate in the first year. Delay sowing the seeds of *Lilium*, *Fritillaria*, *Tulipa*, &c., and you will lose from twenty to eighty per cent. *Campanulas* and *Ostrowskya* readily germinate when sown at once, but if sowing is deferred till spring the seeds will probably lie dormant for a year, if they do not perish altogether."

Frost sometimes has a powerful influence on the germination of seeds which are otherwise slow to move. The seeds of *Kniphofia*, *Tropæolum azureum*, *T. tricolor*, and *Tecophilæa cyanocrocus* germinate much quicker after the soil in which they were sown has been frozen.

On the other hand, excessive heat is often an advantage. All the seeds of *Leguminosæ*, which have hard testa (shells), before being sown should be soaked for a few hours in water that is nearly boiling. In a state of nature the testa never becomes so hard and bony as it does when exposed to drought for a time. Thus the seeds of *Nelumbium*, which naturally drop into the mud below as soon as they are ripe, where they soon germinate, become very hard with exposure, and the embryo is unable to push its way through the bone-like testa, so that it is necessary before sowing the seeds to rub them on a file or grindstone until the embryo is exposed.

4. *Modes of Sowing in the Open Air.*—There are two principal ways of sowing—*broadcast*, or in *drills* or *rows*. Broadcast sowing is merely scattering the seeds over the surface, and is doubtless the most original. But the drill system is now generally adopted, both in the garden and in the field. It has the advantage of admitting of the ground being more expeditiously cleaned and stirred in the intervals,

inasmuch as the hoe, or other implement, can be freely worked; whilst in the case of broadcast sowing no full stroke can be made; for even supposing the plants were to be generally 1 foot apart, every draw or stroke of the hoe must be limited to less than 1 foot along the surface. On the other hand, small plants with spreading roots are doubtless best disposed promiscuously over the surface, unless the rows are made very little distant from each other, or not farther than the roots of the plants extend. With regard to tap-rooted plants—Carrots, for instance—the distance between the rows should be regulated, not so much by the horizontal extension of the roots, as by the space which the tops require, in order to have sufficient light and air.

Seeds will vegetate with due supplies of heat and moisture, but a fertile soil is essential for further progress: thus, the seeds of many plants do not vegetate well in strong loam, although the plants afterwards flourish in soil of that description. In a natural state of the ground, seeds rarely fall upon bare loam, but for the most part among the decayed or decaying vegetable matter with which it is covered; in this the seeds vegetate, and the young plants are nourished by it until they acquire strength to enable them to penetrate the loam.

Seeds sown in patches in borders should be scattered thinly, and the seedlings should be thinned in time. It is much better to have a dozen strong healthy plants on a square yard than twice that number of weaklings. Annuals grown in this way are too often spoilt for want of judicious early thinning. Early-flowering hardy annuals should be sown in the autumn (November). Seeds of tender plants must not be sown till March or April if they are to be placed in the open ground. It is, however, preferable to sow such seeds in boxes or frames in February, and transplant the seedlings into the borders when all danger from cold is passed.

For seeds of indoor plants generally, February is the most suitable time to sow. In large establishments it is the practice to cease all sowing from November till February, except in cases where the vitality of the seeds would be endangered by the delay. Seeds which germinate slowly, such as Palms, Crinums, Pandanus, Aroids, Acacias, may be sown as soon as received. Palm seeds require a temperature of 80° to start them in a reasonable time. Some nurserymen, who raise large quantities of young palms for market, sow them in pans or boxes, which are placed upon the hot-water pipes, and

kept well watered till the plumules appear above the soil. Or a hot-water tank is covered with slates, upon which a few inches of soil is placed, and in this the seeds are thickly sown. Tropical aquatic plants are raised from seeds sown in pots submerged in a tank of water heated to from 70° to 80°. *Victoria regia* will not germinate in a lower temperature than 85°. All large seeds of tropical plants, say those from the size of peas upwards, should be placed over strong bottom heat till they germinate. Fine seeds should be covered with a flat pane of glass and placed on a shelf close to the roof glass in a warm house. Very fine seeds must not be watered overhead, but the water must be allowed to soak up from below. The three essentials to germination are heat, air, and moisture; a fourth, light, is needed as soon as the plumule is above the soil; but it does not matter whether a seed be in the light or in darkness so far as actual germination is concerned.

The very fine seeds of such plants as Orchids, Nepenthes, *Æschynanthus*, Bromeliads, *Sarracenias*, and *Darlingtonia* require to be sown on finely-chopped living sphagnum moss. Good results have also been obtained by using sawdust instead of moss, and very fibrous turves of peat have been known to serve for all except very delicate Orchids. Experts in Orchid breeding sow the seeds upon the surface of the compost in which an Orchid is growing, and it is supposed that better results are obtained in this way than when the seeds are sown in specially prepared pans. Disas have been raised from seeds ripened and sown in one year, and the seedlings have flowered when eighteen months old. *Cattleyas* average about seven years, *Phaius* and *Calanthe* three years.

Fern spores are sown upon peat or loam in well-drained pots or pans. The spores should be gathered before the spore-cases have burst, and be sown at once. The pans should be well watered before the spores are scattered over the surface of the soil. They should then be stood in saucers of water, and a pane of glass be placed over the top. This glass ought not to be removed after once the spores have been sown, or the spores of common ferns are sure to get in and usurp the place of, or interfere with, those sown. When the spores have vegetated, the prothallia should be pricked off in little patches in light soil. If left crowded in the spore-pan, the prothallia often perish before a fern has been developed.

II.—PROPAGATION BY BULBS, CORMS, AND TUBERS.

A Bulb is composed of either modified leaves in the form of scales, as in *Lilium*, or the bases of ordinary leaves folded round each other, as in *Crinum*, and held together by a more or less flattened axis, in the centre of which is the growth bud or buds which never elongate, the flower stem being produced separately from the base of one of these buds. The best illustration of this manner of growth is seen in the bulb of *Lilium*. So long as the growth bud remains solitary, only one bulb is formed, but when more buds are developed the bulb divides into several. Some bulbs rarely multiply in this way, whilst others do so very freely. In the latter cases propagation is accomplished naturally, all that the cultivator requires to do being to separate the bulbs as soon as convenient and grow them on. But for those bulbs which do not divide, artificial means are resorted to for the purpose of multiplication. The central bud is cut out, or destroyed with a pointed stick, and this causes the bulb to develop lateral buds. Or the base is divided into four or more pieces, and this results in the formation of numerous bulbils. Choice Hyacinths are largely propagated in this way, as also are *Pancratiums* and *Crinums*, in fact any true bulb that is strong enough to bear the treatment. Bulbs with scales, such as *Liliums*, may be propagated by breaking off the scales and pricking them separately into pans of sandy soil. Most *Liliums* may be readily and abundantly increased in this way. Some *Liliums* form bulbils in the axils of the leaves, and these may be removed and planted.

Many bulbs develop offsets from the base, as, for instance, in *Crinum*, *Pancratium*, *Hippeastrum*, and *Narcissus*, which may be removed for purposes of propagation.

A Corm is a short, solid, fleshy, more or less conical stem, from which roots spring chiefly below, but also on the sides and upper portion; the buds also are scattered over the upper surface. Some of the buds grow into new corms which supplant the old one, as in *Crocus*, *Colchicum*, *Gladiolus*, &c.; or the corm is perennial, as in *Cyclamen*, *Caladium*, and *Amorphophallus*. Nearly all corms multiply themselves freely, and it is not therefore often necessary to do more than remove the young offsets and grow them on. *Gladiolus* and *Watsonia* produce numerous small basal corms called 'spawn'; they also develop clusters of small corms on

the flower-stems. *Caladiums* are propagated by cutting off the 'eyes' (buds) which are developed all over the upper part of the corm. *Arisæmas*, and in fact nearly all Aroids of this character, are readily multiplied in the same way.

A Tuber is a short thickened rhizome or stem, bearing buds and node-like scars, the best examples being the Jerusalem Artichoke, the Potato, and the Yam. The fleshy subterranean growths of the *Dahlia* are not true tubers, but simply fleshy roots, as they do not bear buds, but are reservoirs. The root-stock of some *Nymphæas* and of *Nelumbium* are tubers. Propagation by means of tubers is simply stem division, and wherever a bud can be severed with a portion of the fleshy stock, it may be utilized.

III.—PROPAGATION BY DIVISION.

Strictly speaking, propagation in every way, except by seed, is effected by division. If we propagate by cuttings, suckers, grafts, or buds, we must, in either case, divide the plant to obtain them. Propagation by division is, however, usually understood to imply the parting of such tufted plants as Orchids, Bamboos, Ferns, and Sunflowers, each part having roots, and, if possible, growing points. The most favourable season for this operation is the spring. It is surprising how much better results may be obtained by lifting big tufts of plants, dividing and replanting them, than is possible if they are left undisturbed year after year. Valuable Orchids often can only be multiplied by division. The same may be said of Bamboos, for which it is the only practicable means of increase, seeds being rarely available. *Adiantum farleyense* is a familiar example among many ferns, for the propagation of which division is the only means. It is not possible, of course, to safely divide plants which do not grow in a more or less tufted manner. On the other hand, it may be accepted as a general rule, that all plants of tufted habit, including even some palms, may be increased by division. The herbaceous perennials that have annual stalks can be divided with a spade or trowel; and such plants as Gentians, Saxifragas, or Box can be dug up and split into slips with some portion of root to each. In some cases, the number of plants which can be obtained by division may be greatly increased by introducing a quantity of fine soil among them, in order that the lower branches may strike root in it; or the plants may be taken up and replanted deeper than before.

IV.—PROPAGATION BY RUNNERS.

Like the Strawberry, many plants emit runners, which proceed along the surface of the ground, deriving nourishment from the parent plant, and develop, at a greater or less distance from it, a bud on the upper side, whilst small projections form on the opposite or under side. These are rudimentary roots, which, under favourable circumstances, strike into the soil, and assist in nourishing the young plant. The growing point of the runner proceeds, and another plant is formed at the next joint or bud, and so on. In propagating by runners, if the object be to obtain as many plants as possible, the old plants should be prevented from bearing flowers by cutting off all flower-buds as they appear. If particularly strong plants are required, the runner should be stopped after it has made one or two joints. By so doing the whole flow of sap conveyed from the old plant by the runner will be appropriated by one or two plants, instead of proceeding onward to supply a number.

V.—PROPAGATION BY SUCKERS.

A sucker is a stem or shoot which springs from a subterranean portion of the plant.

Two kinds of suckers may be distinguished, namely, root-suckers and stem-suckers.

A root-sucker proceeds from an adventitious bud formed on the root, sometimes close to the stem, as in the Gooseberry and Currant, frequently at a considerable distance from it, as in the Plum, Robinia, and Poplar. Roots are normally destitute of buds, but under certain conditions, such as when the plant has been wounded or checked in its growth, buds are formed. In some plants they appear to be normal, as in the Elm, White Poplar, and Bramble. These buds grow and form what are termed suckers, which can be removed with a knife or spade, with a portion of the root attached, or, in the case of plants which do not root freely, the suckers may be partially severed so as to induce them to develop roots. They can then be transplanted with safety. This should be done at the proper time for transplanting the plant from which they are taken.

Whilst it is desirable that suckers intended for propagation should be taken up with roots attached, yet, in doing this, care should be taken not to injure the parent plant by the removal of too many of its roots. If the suckers

spring from a thick root, the soil should be removed, and instead of severing the large root, a slice of it can be detached with the sucker.

Stem-suckers spring from the base of the stem below the surface of the soil. The growth and increase of these suckers is made at the expense of the part of the plant above them. Old plants, and especially any that have been heavily pruned or pollarded, often produce stem-suckers freely. Sometimes a strong sucker will grow with such vigour as to make it worth while to remove the whole of the original stem in favour of the sucker. As a rule a plant which has developed a tendency to produce stem-suckers will continue to do so, the new life thus started at the base of the stem drawing increased supplies of nourishment in that direction. Where there are any latent buds they will be stimulated into growth, and in many cases adventitious buds are formed, which under these circumstances develop into shoots. These shoots when they originate below the ground frequently strike root and form rooted suckers. When they do not naturally strike root, they may be encouraged to do so by partly severing them with a knife from the stem and earthing them up with some good mould, which should be kept moist. If the plant is one of those of which the suckers readily strike, and make sufficient roots in the course of a season to support them, when taken up, as distinct plants, the principal stem may be cut down to the surface of the ground, provided it is of less consequence to preserve it than to obtain a number of young plants by the production of suckers, which the cutting down of the old stem would encourage. But before this proceeding is adopted, some precautions should be taken in case the cutting down of the stem should not have the desired effect. If suckers have already made their appearance, there is no danger; but if there are no symptoms of them, it must be considered whether the plant is one that invariably produces suckers when cut down.

When the suckers are taken from the parent stock they may be considered plants, and treated as such. In many instances, however, it is likely that the quantity of roots will be small in proportion to the rest of the plant; and this also will probably be the case when the sucker has received a large share of nourishment from the roots of the mother plant, as well as from those of its own formation.

From what has been said above it will be evident that suckers are generally injurious to the plant producing them. Of course suckers

of Apples, Pears, Plums, Peaches, of all plants, in fact, that are propagated by grafting or budding, should be cut away as fast as they appear, unless they spring from the scion and not from the stock. Rhododendrons and Roses require to be carefully watched against the growth and encroachment of suckers which spring from the stock.

VI.—PROPAGATION BY LAYERS.

A Layer is a branch or shoot, part of which is introduced into the soil, and strikes root whilst fed by the parent plant, with which, however, its

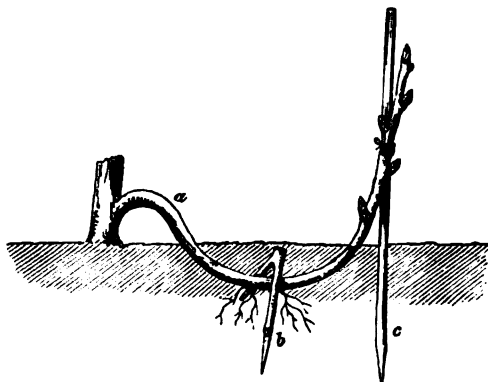


Fig. 293.—Layering.

communication is generally partially interrupted by a cut, slit, or ligature.

According to circumstances, various modes of layering are adopted; the principal are simply bending the shoot or branch and burying the elbow of the bent portion in the soil, twisting, incision, tongueing, slitting or heeling, strangulation or wiring, ringing, serpentine arching, insertion of the growing point, and circumposition. These having been detailed, and the principles upon which they are founded understood, the modes of operation can be varied still more.

1. *Bending*.—This is represented in Fig. 293, where *a* represents the branch to be layered; *b*, a hooked peg or stone to keep it down; *c*, a stick to maintain the extremity of the shoot in an upright position. This method is adopted for all plants which fully develop adventitious roots from the stem under the influence of a slight check or when kept soft and moist. The extremity of the shoot may, in most cases, be more or less shortened, so that the buds left may have the more sap to enable them to push vigorously. When a straight stem is required, the terminal bud may be preserved, and the end above-ground kept upright by a stick. Or

the shoot may be cut down to two buds above the surface, and when they push, the strongest may be selected to be trained upright for the future stem, and the other rubbed or cut off. If in the course of the season buds should push into shoots on the part of the layered branch between where it is laid in the ground and the parent stock, they should be checked, otherwise, from their upright position, the sap would flow into them rather than along the more depressed part towards the extremity where it is wanted to produce leaves; for on the elaborated sap returned from these the formation of roots depends.

2. *Twisting*.—This is performed in the same way as the preceding, except that the branch is twisted, in order to check the returning sap, and consequently favour the emission of roots.

3. *Incision by Splitting*.—Small branches are sometimes split by thrusting a sharp-pointed knife through the middle of the branch at the part which is to be laid in the earth, and then splitting it longitudinally to the extent of 2 inches or so, more or less, according to the size of the branch. The parts are kept separate by a piece of wood or stone. The split, of course, occasions an obstruction of the sap, and allows of the emission of roots by the edges of the cleft.

4. *Tongueing or Heeling*.—This is represented by Fig. 294, where *a* represents the branch cut half-way through at *c*, by entering the knife about the lowest part of the bend below the bud *b*, and cutting upwards; the branch, being then placed at the proper depth in the hole in the

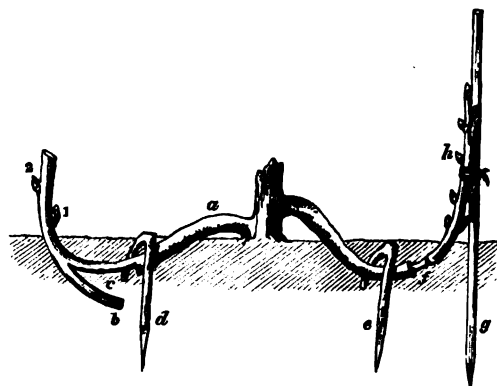


Fig. 294.—Layering by Tongueing and Ringing.

soil made for its reception, is kept from springing up by the hooked peg *d*. In placing it, care must be taken to keep separate the divided portions at *c*, to allow of the free development of callus and root. A piece of stone, hard soil, or wood is sometimes employed to keep them

apart. It is also necessary to observe that all buds, including that at *b*, should be rubbed off or cut out before the shoot is laid down. When a shoot is cut a little above a joint or bud, the divided part is apt to die up to the next joint; but when cut immediately below the joint, the heel usually keeps alive to the joint situated at its extremity. Instead of the tongue or heel being formed on the under side of the branch, it is sometimes made on the upper side. The branch is then twisted, so that the tongue may be placed in a perpendicular position and in a downward direction. In other cases it is cut on either side of the branch, but in general it is preferable to make an incision on the under side, unless the shoot is of a brittle nature, and may bend when cut on the upper side with less danger of breaking.

5. *Strangulation or Wiring*.—If a wire is twisted tightly round a branch, the ascending sap will flow along the vessels of the alburnum, but the returning sap, descending by the inner bark, will be checked. Woody layers continue to be formed so long as the outside bark admits of being compressed; but by degrees the portion of it within the ring becomes hard and so compact as to prevent the return of the sap below the ring, and of course the further deposition of woody layers. An accumulation of the returning sap then takes place above the wire. Exposed to the drying influence of the air, roots do not readily break out in consequence of this accumulation; but an increased deposition of woody matter is indicated by the swelling of the branch to a much greater thickness immediately above the wire than below it. When, however, the part around which the wire is twisted is laid in the earth, the accumulated sap tends to form roots, and to encourage their breaking out the part above the ring is sometimes cut with a sharp knife in various places quite through the inner bark.

6. *Ringing*.—This mode is represented in Fig. 294, where *e* is a hooked peg, the use of which is obvious; *f*, a portion of the branch from which a ring of bark has been removed; *g*, a stick, to which the extremity of the shoot *h* is trained. The ring at *f* should be taken off quite through the inner bark, otherwise the returning sap would pass by it to the stem, and thus the object of ringing, to interrupt it, would be defeated.

7. *Serpentine Layering*.—This mode is very applicable to the Vine, Wistaria, Clematis, Lapageria, and other plants that make long running shoots. It is represented by Fig. 295. The shoot *a* is layered at every 2 feet, or less,

according to the nature of the plant, its pliability, and the situation of the buds. Each curve above-ground, *d, d*, must be furnished with a bud or buds, whilst from the portion below-ground, held down by pegs *b, b, b*, the buds may be

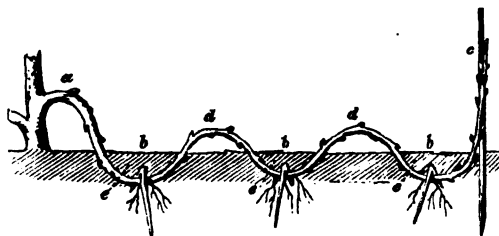


Fig. 295.—Serpentine Layering.

rubbed or cut off. The extremity *c* is supported by a stick, and when the shoot is sufficiently rooted at the different parts laid, it is cut as represented by the dotted lines *e, e, e*. When this mode of propagation is adopted in summer with a growing shoot, the latter must be layered as it proceeds in growth, and the leaves on the part above-ground should be preserved and encouraged; consequently, the shoot will have to be laid shallow, and the curves to be but slight. Sometimes, pressing the root at its joint the depth of its thickness in the soil, and then laying small stones upon it, will be sufficient.

Lapageria is propagated by burying the whole of the strongest stems under a thin layer of sandy peat so placed as, whilst it covers the stems, a portion of the leaves is exposed to the light. The axillary buds will in time start into growth; these are trained up stakes, and when about a year old they are partially severed from the mother stem. As soon as roots are formed, the young stems may be transferred to pots. Many climbing and trailing plants can be propagated in this way.

8. *Layering by Insertion of the Growing Point*.—Many plants will produce roots in surprising abundance by merely inserting the growing point of the branches in the soil, for instance, the Rubus, Gooseberry, Currant. Although not often practised, this mode of propagation deserves notice, for it can easily be tried, and doubtless will often be found successful in the case of many kinds of plants that are difficult to propagate by other means.

9. *Circumposition* is an old term for a mode of propagation employed in cases where the branch is far from the ground, or when, from stiffness, brittleness, or other circumstances, it cannot be bent down. Whilst the branch, for any of these reasons, retains its position, some

soil or compost is carried up, and in various ways made to surround it. Pots as shown in Fig. 296, or boxes made of slate, not being porous like those of earthenware, would be proper for this mode of propagation. An excellent contrivance for this purpose is a piece of thin tin-plate, folded in the shape of a funnel, and fixed with clips round the branch. It is filled with moss or soil, which is kept moist by a drip from a bottle of water fixed above it, with the cork pierced so that the water can drip slowly on to the branch operated upon.

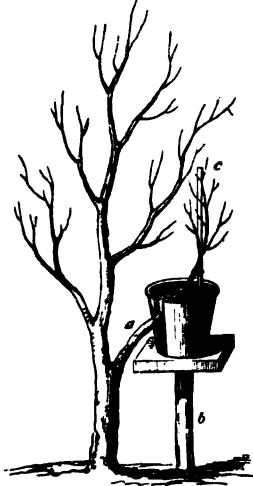


Fig. 296.—Layering by Circumposition.

The Chinese ring a part of a branch and then fasten round it a large ball of clay and cow-dung, well incorporated, and similar to our grafting clay, the whole being maintained in a moist state by means of a vessel placed above it and kept supplied with water, of which enough is allowed to escape by a small hole at the bottom. This method was practised in Britain more than one hundred and fifty years ago. Reid, in his *Scots Gardener*, published in 1721, after describing the mode of propagation by circumposition, says:—"I have effected this with clay and cow's dung, well mixed (after part of the bark has been taken off round), and wrapped about with a double or triple swaddling of straw or hay ropes."

VII.—PROPAGATION BY CUTTINGS.

A cutting is any rootless portion of a plant other than the seeds that is removed and utilized for purposes of propagation—whether it be a branch, a portion of a branch, a leaf, or even a fleshy root. When properly selected, duly prepared, and placed under favourable circumstances, the cutting emits roots and grows, and thus an individual plant may be increased to an extent corresponding to the number of parts eligible for cuttings which the plant can afford at once or in succession. With the exception of seeds this is the commonest of all methods of propagation, and, as a general rule, by far the most expeditious and satisfactory. The special

advantages of propagation by cuttings as compared with that by seeds is that by the former we reproduce exactly all the peculiarities of the parent as completely as if the cutting was still a part of that parent, whereas by the latter, viz. seeds, the special characters of the parent may not, generally will not, be reproduced.

If a plant be cut off by the surface of the ground, and consequently be deprived of its nourishment from the roots, it will, if kept in a moist condition, notwithstanding, remain alive, for a time at any rate, and its buds will continue to attract the sap from the vessels with which they are connected, and will expand into leaves. These, as well as the others with which the cutting may be already furnished, will continue to perform their functions nearly as before the separation of the plants from its roots, that is to say, they will elaborate the sap if there is a constant supply of moisture from below, or if the atmosphere about them is kept saturated so that evaporation is prevented.

As long as the leaves have a supply of sap they will continue to elaborate and convert it into organic nourishing matter, which is expended in the upward growth of branches and in the formation of new wood in every part of the plant down to the remotest rootlets. If, then, the connection between the roots and the top be severed, that matter which would have gone to the formation of roots is arrested in its course; it therefore accumulates at the lowest point, and, if other conditions be favourable, will in time form a new system of roots. Some plants are so constituted as to be able to do this readily, others do it very slowly and only under very favourable circumstances, and others appear to be incapable of doing it. Success depends, however, upon various circumstances, to which it is necessary to advert. The cuttings require to be of a certain age and size; to be inserted at the proper season, and in a suitable medium; and afterwards kept in a well-regulated condition as regards heat, moisture, and light.

Selection.—Cuttings should be taken, if possible, only from healthy plants, and from parts of these which are not in a weakly state; for if the shoots or branches of a plant are not in a condition to make a fair growth with a supply of nourishment from the roots of the parent plant, they cannot, when made into cuttings, be expected to possess sufficient energy to develop roots. At the same time, excessively vigorous shoots, accustomed to receive a very abundant supply of nourishment, are not so well able to keep alive, when deprived of that supply, as

others that have been less highly fed. Some kinds of trees, as the Willow and Poplar, strike from either old or young wood; but most strike more readily, and make the best plants, from well-matured shoots of the current year's growth. In the case of hard-wooded plants difficult to strike, considerable nicety is required in selecting a portion of the shoot, the wood of which is neither too old and hard, nor too young and soft; for in the former case roots are not readily emitted, whilst in the latter the cuttings are apt to damp off. A knowledge of the proper degree of firmness which the cutting should possess can only be acquired by practice, and this differs in different plants. When not exactly known, it is well to insert cuttings of different degrees of firmness, and observe for future guidance the condition in which they succeed the best.

Time of taking off Cuttings.—The cuttings of hardy deciduous trees and shrubs should be taken off preferably in autumn, before the fall of the leaf, or early in spring, as soon as the sap begins to move. As it expands, by the increased warmth of spring, the buds swell, and sap is returned to form callosities, and the more readily if placed in soil that is moist and warm. It is not as a rule advisable to take cuttings from such plants when the sap is in full flow, and when the leaves from buds formed in the previous summer are just expanding, although young green shoots will sometimes strike freely if placed in a close frame or on a hot-bed. At that period of their vegetation they evaporate the moisture contained in the cutting with great rapidity, and at the same time return organized tissue but slowly, so that before enough of it to produce roots is accumulated, the cutting is exhausted. As a general rule, cuttings should be taken off either when the growth of the plant is in a half-ripened state, or when it is about to spring into fresh growth.

Cuttings of soft-wooded plants in spring, and of hard-wooded plants in autumn, is a good general rule for the planting of all cuttings. This applies specially to plants that are not easily raised for cuttings. There are, of course, hosts of garden plants which may be readily propagated at any season of the year. All, however, succeed better at one period than another. Plants which fail in one month should be tried the next, and so on, till the right time is hit upon. There are, generally speaking, time and treatment which answer for all plants. Numerous instances could be given of plants which were supposed to be impossible to raise from cuttings, but which afterwards proved to be

easily managed when tried at an unexpected season or under some peculiar treatment. Again, cuttings of very young shoots have succeeded where those of ripe wood have failed.

Preparation of Cuttings.—In the south of Europe, where the ground is much warmer than in this country, branches of Apple or Pear trees, of the thickness of a man's wrist, are cut into lengths of 2 or 3 feet, pointed, and driven into the ground, where they strike root, and soon form strong-stemmed plants. Stout Willow-stakes are sometimes driven in, to form a fence in watery places, or to mark a boundary in such situations, and they soon take root. In one instance Willow-stakes for this purpose had been sharpened at the smaller or top end, and driven in bottom upwards; yet they grew, although not so freely at first, as if the sap had risen through vessels not so inverted. Cuttings of many plants—as, for instance, the Gooseberry and Currant—emit roots, not only from the base of the cutting, but also along the side. In these and other kinds of cuttings from deciduous trees the buds on the under-ground part of the cutting must be cut, picked, or rubbed out, otherwise they would, sooner or later, push into shoots, and produce an inconvenient number of suckers.

When a plant is difficult to strike by the ordinary mode of cutting off a portion of branch or shoot for immediate insertion it is a good plan to ring it below a joint about midsummer. The returning sap being checked, a swelling commences above the ring, and continues to increase till active vegetation ceases in autumn. The branch should then be cut off below the ring, and laid in the soil till spring, in order that the swelling may be softened by the moisture of the soil, to facilitate the formation of roots. In spring the cutting is taken up, and the ringed portion cut off close by the under part of the swelling; the cutting is then again inserted in the soil to the proper depth, the top having been previously shortened to a few buds above the joint corresponding with the surface. Instead of ringing, a ligature is sometimes employed to obstruct the returning sap. For this purpose a small wire is generally used, but in many cases a piece of fine twine, drawn very tightly, will answer better, as it is not liable to corrode, like metallic substances.

Instead of being cut off, the portion to be propagated, consisting of a lateral shoot, is occasionally torn off with a *heel*, the separation presenting a somewhat oval surface, which is smoothed with a sharp knife. The section then

is oblique to the direction of the fibre, and is, of course, larger than if it had been made right across the shoot, consequently it presents a larger area of root-forming wood.

Cuttings of some plants strike more readily when, after having been cut across, they are split upwards about half an inch, more or less, according to the size of the cutting. The shoot should be cut with a very sharp knife immediately below the joint. Some of the lower leaves should be cut or clipped off very little farther from the base than the length to which the cutting is inserted in the ground. The older leaves elaborate more sap for the formation of roots than the very young ones; and, from being near the moist surface, they absorb moisture, or at least they do not evaporate so much as when they are elevated from that source of moisture. The petioles of the leaves to be removed should be cut off as close to the stem as can be done without injuring the bark.

Generally it is not convenient to leave foliage on that portion of the cutting to be buried in soil, as the work of planting would be rendered thereby much more difficult, and it would be impossible to accomplish it without breaking the leaves or their stalks in the process. Leaves of large size—for example, those of *Ficus elastica* and *Cyanophyllum*—are considerably reduced on the cuttings. The leaves of all cuttings should be washed clean before planting. Some plants, such as *Boronia*, *Epacris*, *Cytisus*, and *Acacia*, yield the most likely cuttings after they have stood for a few weeks in a higher temperature than they naturally require.

The materials in which cuttings are struck are various; but silver-sand, white and pure, is that which is most in use, and on the whole found to answer best. It is free from decaying matter, and therefore does not induce putrefaction. It is porous, and affords a ready passage for the young roots, yet, being fine, it retains moisture by capillary attraction. It contains very little nourishment, but scarcely any besides what may be dissolved in the water is required till rootlets begin to be formed. The sand, as already mentioned, should be pure and free from the oxides of iron. For very delicate things it should be well washed before it is used. Except for comparatively few plants, a portion of soil should be mixed with the sand. That kind of soil in which the plant itself thrives is suitable for the cuttings, but it must be finely sifted. Easily-rooted cuttings, such as *Fuchsias*, *Pelargoniums*, *Dahlias*, and *Chrysanthemums*, will do in a mixture of five parts of soil to one of sand. Hard-wooded

Heaths, *Epacris* and such like fine-rooted plants, require three parts of sand to one of fine peat. Sand is more expensive than soil, and therefore no more of it need be used than is necessary. Many plants, such as Laurels, some kinds of Roses, *Chrysanthemums*, &c., will strike in common garden soil. Various other substances, as powdered charcoal, brick-dust, burned clay, chopped moss, and water, have been employed.

Many plants will strike and grow in chopped sphagnum moss, and if they are to be grown for some time in the pots in which they are struck, some leaf-mould or peat, mixed with the moss, will be advantageous.

Cuttings of many plants will readily strike root if their ends are put in water, provided it be of the proper temperature. Bottles, saucers, or jars may be employed to hold the water; but as light is not necessary for the production of roots, which are usually and best formed in the dark, the vessel, if transparent, should be shaded. Roots grown in water are disposed to subdivide exceedingly, so that many are as fine as hairs, and when taken out of the water are too delicate to act well in the soil. It is therefore advisable to remove the cuttings struck in water at an early stage of the growth of the roots, before their length becomes too much out of proportion to their thickness. It should be observed that the soil in which plants struck in water are planted ought to be fine, and kept moist; and the plants should be carefully shaded till they strike fresh root. Large cuttings of *Yucca*, *Dracæna*, *Pandanus*, *Dieffenbachia*, *Oleander*, &c., may be conveniently rooted in this manner.

The preparation of an ordinary cutting pot may here fittingly be given. The pot should be clean. Fill up two-thirds of it with clean potsherds. Over this place a layer of rough material such as soil siftings or sphagnum moss. Then put in the compost, loosely if for soft-wooded or herbaceous plants, firmly if for hard-wooded. Over this put a thin layer of silver sand. If the cuttings are small, water the whole well before planting them, and again after they are planted; but if large, do not water till after planting. Be careful to push the cutting to the bottom of the hole made by the dibber. Do not allow the cuttings to flag at any time if preventible. These directions, if modified, will apply to pans, boxes, hand-lights, and frames intended for cuttings.

Insertion.—Cuttings of hardy plants that strike in the open air are sometimes inserted by means of a dibber; but it is always better, when circumstances will permit, to cut off, by a line, a

straight edge in the dug soil, and place the prepared cuttings against it, pressing the soil closely round them. When propagation is effected under glass, and the cuttings are small, a pointed stick or dibber proportioned to their size is employed. Some kinds do very well when planted equally over the whole surface; others do better when inserted near the sides of the pot—a circumstance which is not easily accounted for, but that such is the case is a well-known fact. The roots of a plant increase more readily when they reach the sides of a pot than they do previously when in the soil. Stones in arable land have a similar effect, for they have been frequently observed matted with roots. This may be owing to there being a less cohesion between the soil and the stone than between the particles of the soil itself, and consequently a freer passage for roots will be afforded in the former than in the latter case.

Temperature.—Cuttings of most plants start more readily when kept in a close moist atmosphere, and a temperature a few degrees higher than that of the average temperature in which the plant itself thrives. Thus, a frame for the cuttings of tropical plants should be kept at about 75°, and if bottom heat is used it may be kept at 85°. The effect of bottom heat, i.e. a high temperature about the soil in which the cuttings are planted, is to stimulate the flow of sap and to induce the early formation of callus and roots. Cuttings of hard-wooded plants do not require bottom heat, but for those of such plants as *Ixora*, *Allamanda*, *Codiaeum*, *Dracæna*, &c., it is an advantage.

Hotbeds made of stable-dung are useful in spring for cuttings of ordinary garden plants. On the other hand, a large number of plants can be multiplied by means of cuttings planted under a hand-light or bell-glass, and placed in a shady place in the house along with the plant from which the cuttings were taken. In autumn many plants will root freely in the open air in full sunshine. The atmospheric conditions in which cuttings are placed should vary with the nature of the plant.

Cuttings of succulent plants strike root readily in an ordinary house without any covering. Cuttings of herbaceous plants of thin texture must be prevented from shrivelling through exposure to sun and air, or from turning yellow through excess of moisture with a low temperature. In regulating the temperature it is necessary in the first instance to take into consideration that in which the plant from which the cuttings are taken has been growing. Sometimes the plant is forced, in order to pro-

duce shoots for cuttings, which therefore require a higher temperature than that to which they were subjected in the parent plant. Cuttings taken from deciduous plants in a dormant state, and furnished only with buds, should be placed at first in a temperature very little higher than that which is sufficient to excite and swell the buds of the parent tree.

Moisture.—The extent of surface by which a cutting can absorb moisture for supplying evaporation is small, compared with that possessed by well-rooted plants. It is therefore necessary to adopt means to limit the amount of evaporation, so that it may correspond as nearly as possible with that of absorption. The free air is frequently too dry for delicate cuttings, on which account a sort of artificial atmosphere is formed by them by propagating-glasses or hand-glasses. It is possible by means of these to maintain a constantly humid atmosphere; but, on the other hand, this is not congenial to the stems and foliage of some plants, and accordingly there is danger of the cuttings damping off. It would therefore be desirable that moisture should be regulated like heat, but it is more difficult to accomplish. When the earth, sand, or other substance in which the cuttings are inserted is kept moist, and a bell-glass pressed closely down upon it, the bottom heat will raise vapour to keep the air within the glass in a saturated state, and whilst that is the case, evaporation from the surface of the leaves cannot take place.

It is therefore advisable to remove and wipe at least once a day the lights or bell-glasses, and to allow them to remain off the cuttings for about half-an-hour. In properly-managed propagating houses this is a duty which is never neglected. Staleness of the atmosphere, so productive of damp, mildew, &c., is thereby prevented. It also affords a convenient opportunity for the cuttings to be looked over, all decaying or damp leaves and dead cuttings to be removed; those which require it are watered, and any that show by new growth that they are rooted are removed to the 'hardening-off' quarters.

Success with cuttings depends very largely upon the care and attention they receive during the root-forming process. Cuttings of many plants strike root readily if placed with their bases in water; indeed cuttings of some plants which fail when planted in soil in the ordinary way, succeed under the water treatment. The operator should, in the matter of watering and atmospheric moisture, be guided by the character and habits of the plant he wishes to multiply.

All plants which like plenty of moisture can be multiplied by means of cuttings kept in moist close conditions; plants which require a drier atmosphere and plenty of air should, when in the cutting state, be kept less close than the former. We root a Cactus by drying it in the sun, whereas the cuttings of a Begonia, Nepenthes, Bouvardia, Poinsettia, &c., must be kept moist, close, and shaded. An excellent remedy for 'damp', which often plays much havoc among cuttings of soft-wooded plants, such as Lobelia, Verbena, Viola, &c., is a weak solution of permanganate of potash (Condy's Fluid), with which the pots affected may be watered without injury to the most delicate cuttings, and generally with the most curative results so far as the 'damp' is concerned. The solution when mixed should be not darker than sherry.

Light.—Generally speaking, cuttings require less light than is essential to the healthy growth of rooted plants. An excess of sunlight induces rapid transpiration and consequent weakness. All cuttings should, however, have as much light as they can well bear, and some will bear much more than others; thus, Pelargoniums will strike well if exposed to the direct rays of the sun, and so will many other plants of a succulent nature.

Bell-glasses (cloches).—These are among the most useful of the appliances of the propagator, and a supply of various sizes should always be kept in readiness. It is surprising how many plants may be propagated by means of cuttings planted in a pot and covered with a bell-glass, or in a shaded border and covered with a 'cloche'. There are variously formed and tinted bell-glasses to be had, the ordinary green-tinted bell with a knob at the top being the cheapest and most useful. Some propagators prefer the white glass, and the knob at the top pierced with a hole to let out excessive moisture. The 'cloche' is a large bell-glass much used by market gardeners for sheltering delicate plants as well as for protecting cuttings. It is advisable to stipple them with paint or any shading mixture if intended for cuttings outside where shade is needed. Flat-topped glasses are antiquated and not to be recommended for propagating purposes; the dome top is preferable, as the moisture condensed on the glass inside runs down easily. Different coloured glasses have been employed in France; according to Neumann, blue and violet-coloured are preferred; but in the climate of Britain the light is less powerful than at Paris, and white or green-tinted glass is considered the best.

VIII.—PROPAGATION BY LEAVES.

The first attempt on record to raise a tree from a leaf was made by Mandirola, an Italian horticulturist, whose mode of proceeding was published by Richard Bradley in the beginning of the last century. This mode of propagation is now often advantageously practised for such plants as the Gloxinia and numerous other Gesneriads, Bertolonias, Begonias, Echeverias, Pinguicula, &c. There is no physiological reason why the leaves of all bud-producing plants should not develop buds and roots under favourable conditions. It is always worth while to try them in the case of new and rare plants of which a stock is wanted quickly.

Roots and buds, it has already been stated, derive their origin and their rudimentary substance, either directly or indirectly, from the leaves. This being the case, it might be possible to propagate most plants by their leaves, provided the latter could be kept alive, after being detached from the stem, such length of time as would allow of a sufficient quantity of cellular tissue being elaborated and protruded from the petiole, or from the section of the midrib, to form granulated callosities for the production of spongioles and adventitious buds. The leaves of some plants, whilst not detached, return cellular tissue abundantly to the roots by the processes of digestion and continuous supply. The crude sap which leaves are capable of containing is in some quickly elaborated, and as quickly replaced; so that, although all the sap which such leaves contain at any instant may afford but a very small quantity of matter available for the formation of roots and buds, yet, when the supply is continuous, the amount may be considerable in the course of several weeks.

In selecting leaves to be used as cuttings those that are either too young or too old are not suitable. The energy of young leaves is employed towards their own growth. Mr. Knight, in his *Physiological Papers*, p. 34, states, that "young leaves expend, in adding to their own bulk, that which ought to be expended in the creation of shoots". On the other hand, leaves that are too old may be considered to have performed their functions, or nearly so, and therefore on the eve of becoming inactive, or of entering into a state of decay. Leaves that are full-grown are to be preferred; such will generally be found in the middle part of the shoot. Some recommend the petiole to be inserted its whole length. M. Neumann cuts it off nearly close to the base of the blade. The

foot-stalk, or whatever part of it is left, should be inserted, up to the base of the blade, in pure white sand, laid over sandy peat, or other compost suitable for the growth of the plant after the leaf has struck root. When the foot-stalk is cut off close to the base of the blade, the latter should be laid flat and the base part slightly inserted in the sand, in which it should be kept by a small peg or stone and covered with a pane of glass or bell-glass, the edges of which ought to be well pressed into the sand. They should then be placed in the same temperature as is required for stem-cuttings of the same plant. The glasses must be shaded at first, and the atmosphere kept moist.

Buds are formed on the principal nerves as well as on the midrib. It is therefore a good plan to cut these nerves across in several places without, however, severing the lamina. Thus treated a single leaf is capable of producing a large number of plants. Generally callus is formed on the lower part of the severed portion, and from this roots are emitted before any leaf-bud is perceptible. Plants raised in this way assume the juvenile character of seedlings. They always, however, reproduce the peculiar characters of the parent plant. Buds are, in some cases, emitted from the indentations of the margin, as in *Bryophyllum proliferum*.

IX.—PROPAGATION BY ROOTS.

All plants that readily throw up root-suckers, as the Hawthorn, Poplar, Elm, Plum, &c., may easily be propagated by cuttings of the roots. Although the normal formation of growth-buds is in the axils of the leaves, yet buds frequently appear irregularly on any part of the stem and also on the roots. These are termed *adventitious buds*. If healthy, vigorous roots of, for instance, the common Hawthorn, are chopped into short pieces, scattered on the surface of a piece of raked, dug ground, and then covered with soil, they will develop into plants. Although cuttings of the roots will strike when laid horizontally, yet it is better to plant them in an upright position, with their tops level with the surface, or only covered with the slightest possible quantity of soil. The cuttings may be from 3 to 9 inches in length; and in planting, care should be taken that the end which was nearest the stem be placed uppermost.

The White-thorn, Plum, Apple, Pear, Quince, Rose, Robinia, Poplar, Elm, Mulberry, Maclura, Rhus, Calycanthus, Paulownia, and Sophora are some amongst the many trees which may be

propagated by roots. Many herbaceous plants, as the Horse-radish, Sea-kale, *Anemone japonica*, &c., may also be increased in the same way. Some Coniferous plants are difficult to strike from branches, or if they do, are apt to retain the character of branches; but by root-cuttings, shoots that have the true character of stems are produced. It may be mentioned that a plant raised from a root-cutting bears leaves, flowers, and fruit exactly similar to those of the original tree. For instance, trees have been reared from the roots of the Ribston Pippin, and they possessed all the excellent qualities of that well-known Apple. Many Ferns produce adventitious buds on their roots. *Platycerium*s may be propagated by means of roots cut off and sown in pans of peat and chopped sphagnum. A series of papers by Mr. Jenman on the ferns which bear root-buds was published in the *Gardeners' Chronicle* in 1885, vol. xxiv., p. 371, *et seq.*

X.—PROPAGATION BY GRAFTING.

Grafting is an operation in which two cut surfaces of the same plant, or of different plants, are placed so as to unite and grow together. The cutting, or portion cut off, is termed the *scion* or *graft*, and the rooted plant on which it is placed or *worked* is called the *stock*.

The art of grafting is of great antiquity, but by whom it was discovered is not known. It is spoken of by Theophrastus, Aristotle, Varro, Pliny the naturalist, Virgil, Agricola, and other ancient authors. It would appear, however, from their writings that the principles were very imperfectly understood, otherwise they would not have entertained the belief that the Vine could be grafted on the Walnut or Cherry, and the Peach on the Willow; or that black Roses would be the result of grafting on the Black Currant; for these plants, having no natural affinity, can never form a vital union, however accurately they may be mechanically joined.

The modes of grafting are exceedingly numerous, but they all depend upon one principle, which should be well understood.

If a tree is cut horizontally through in autumn, or before the sap rises in spring, and if the section be covered over with grafting-clay or other material, so as to protect it from the drying effects of the air, it will be found that in the course of the season a protrusion of tissue will take place, all round, from between the wood and inner bark. Sap may exude from the woody part of the section, but that sap produces no organized

tissue; when exposed to the air it evaporates, and its residuum, if any, is dead matter. Additional organized substance is only formed, as above stated, at the circular line which traces the limits between the wood and inner bark. There it may be frequently observed projecting above the level of the section of the stem, and thus rendering evident the seat of organization, where nascent tissues readily unite when brought in contact with similar tissues in a young and active state. This constitutes the fundamental principle of grafting.

With regard to the cutting intended for the scion, if it is cut off whilst its buds are but little expanded, and its lower end be inserted in the earth, cellular substance will protrude from that end, as the warmth of the season expands the sap, stimulates the buds, and excites the vital action of the tissues.

Now, if the cellular substance thrown up from the cross-cut stem, and that thrown down by the cutting, could meet each other before the air formed a sort of skin on their respective surfaces, they would coalesce and unite. Such a union, however, would be very insecure, for it is difficult to fix firmly together two pieces of any substance end to end. The scion in this case would derive no mechanical support from the stock to keep it in an upright position; and it would be very liable to be displaced before the cellular substance above mentioned could acquire a sufficiently woody nature to enable it to resist the slightest disturbing force.

If in the young stem, represented by fig. 297, the edge of a sharp knife be inserted at *a*, and with one straight sloping cut brought out at *b*; and if the parts be again joined exactly, ties at *c* and *d* will hold them together so that they would not be readily displaced. The ascending sap, interrupted by the section *a b*, will not accumulate at *i*, but will pass along by the inner bark of the section between *a* and *b*, and will there meet with the tissue descending from the upper part *a b i*, which may be termed the scion. Presuming that the parts are very exactly fitted, a most perfect example of grafting will be obtained; like parts will be everywhere joined to like, and the whole will be in the best possible position for uniting; the outer barks will coincide perfectly, so will the inner barks, and every part of the wood will be brought in contact with its counterpart. It is not, however, to the junction of the outer barks, nor on that of the woods, however exact, that the success of the operation is attributable, but it is on the junction of the *inner barks* that union depends. This

is the leading principle in all the modes of grafting, and they may be infinitely varied, provided that principle be kept in view. Strictly speaking, the vital union is not effected by the contact of the portions of inner bark, for it, like the outer bark, is a part already *formed*, whereas



Fig. 297.—Grafting.

the union takes place in consequence of the contact of tissues that are in a *forming* state; such tissues are formed by the cells of the cambium, which lies between the surface of the alburnum and the inner bark; but the latter is a convenient term to use, because it is generally known; and if two portions of inner bark be joined edge to edge, the substance immediately below them will also be in contact. If we take a piece of clean-grown Willow branch in spring, when the sap is in motion, and beat it a little, an entire cylinder of bark may easily be taken from the wood, the latter exhibiting a smooth, slippery surface, as if it had been rubbed with tallow or thin gum. The inside of the cylinder of bark will be found coated with a similar substance. If we take a piece of older wood, with bark as much as $\frac{1}{2}$ inch thick, dead, rugged, and corky on the outside, yet on removal the internal surface of the wood beneath it will be found smooth, and lubricated with the organizing sap. It is the place where this forms a thin semi-fluid layer that should be joined in grafting, and this will be the case if the inner barks are placed in contact.

We have supposed fig. 297 to represent a plant; let us now suppose that the stock *k d e* is a Quince, and that the scion *a b i* is a Pear shoot well joined. If so, all other circumstances being favourable, a union will take place, and the Pear shoot will grow into a tree, fed by the roots of the Quince; whilst the latter will add to its bulk by means of sap elaborated by the leaves of the Pear. But whilst this takes place, whatever wood is added to the Quince side of the line *a b* will be Quince, and that on the Pear side of the same line will be Pear. If the bud *e* should be allowed to push, it would produce a Quince shoot, although the stem opposite to it chiefly consists of Pear wood; and, on the contrary, the bud *f* would give rise to a Pear shoot, although backed by Quince wood. The stock may modify the graft, just as different soils will modify the growth of plants that derive their nourishment

from them; but the stock does not otherwise essentially alter the nature of the tree grafted upon it. There is a common communication of fluids between the vessels formed above and below the line *a b*, but the Pear and Quince form their own peculiar secretions from the same common source. Wherever there is Quince bark in a healthy state, under it Quince wood alone will be formed; and wherever there is Pear bark, Pear wood only will be produced. The elaborated sap from leaves on shoots pushed by the buds *g h* does not in its descent form a layer of Pear wood from *b* to *k* over the Quince, although M. Gaudichaud and others were of opinion that wood was an assemblage of the roots of buds, extending from the latter to the extremities of the roots.

"A graft bears the same relation to its stock as an adventitious shoot to the plant on which it grows. When the parts have once united by means of the cellular tissue, and when the first fibro-vascular elements have been formed, there is perfect continuity between the wood and the cambium, or between the inner bark of the stock and those of the graft. All the other anatomical phenomena are also the same, for although the nature of the stock is not modified by the graft, the vascular filaments (called erroneously radical fibres) or vessels, for they are nothing else, do not the less appear to descend from the graft to the stock, in the same way as they seem to descend from the adventitious shoot to the stem that bears it. This is in both cases merely an appearance, because cellular multiplication is always carried on horizontally, and because it is the cellulæ which result from this horizontal multiplication which change, some into vessels and others into woody fibres and medullary rays.

"Like the adventitious shoot, the graft draws nutriment from the wood of the stock, it elaborates it in its leaves, and returns it principally by its inner bark to the lower part of the plant. In descending from cell to cell the juices leave part of their assimilable substance; each cellule appropriates what is best adapted to its nature. This is the reason why the nature of the stock is no more modified by the juices which descend from the graft than the latter is by the juices which it derives from the stock. The cells nourished in this manner produce, by their division in a horizontal direction, cells of the same nature as themselves, which are modified according to the functions they are called on to fulfil." (*Trécul*.)

Affinity between Graft and Stock.—However well the operation of grafting may be performed,

and that in accordance with the principles already explained, yet the results will be unsuccessful unless the stock and scion are nearly related, such as varieties of the same species, species of the same genus, or genera of the same natural order, beyond which the power does not extend. The Pear will succeed on the Pear, Quince, Hawthorn, Mountain-Ash, and Medlar; but it can scarcely be said to do so on the Apple, although it is less dissimilar in appearance than some of those above mentioned, and which have, in fact, a greater generic difference. The Peach and Nectarine succeed on the Almond, a species of the same genus, and also on the Plum, a different genus. Much as is practically known with regard to the species and varieties that will agree with each other when grafted, yet there is much which can only be learned by experience. For instance, some kinds of Pears do not succeed well on the Quince; and it is only after trial that such as do, and such as do not, can be distinguished.

Modifying Influence of the Stock upon the Graft.

—This chiefly arises from the stock supplying the graft with a greater or a less amount of nourishment than it would receive from its natural root, and consequently producing a more or less vigorous growth. It is, however, to be remarked, that if a weak-growing variety is worked on a stock that is comparatively too vigorous, a strong growth may be induced in the first instance; but in such cases a disparity in the rate of increase in the size of the stems checks the free circulation of the sap at the point of junction, and the tree is apt ultimately to become stunted. In short, too great a disparity in the nature of the graft and stock should be avoided, if a steady growth be considered desirable. When the nature of the stock is such that its stem increases in diameter quicker than that of the scion, the latter usually grows more vigorously than on its own root; but as the swelling increases at the junction beyond certain limits, the flow of sap is checked, and a degree of vigour annually decreasing is the consequence. When, on the contrary, the stem of the stock is naturally of slower growth than that of the kind worked upon it, a dwarfing effect is the immediate result. Such, for instance, is the case when a variety of the Apple is worked on the French Paradise.

The hardiness of the stock is of great importance in the cultivation of trees and shrubs indigenous to southern climates, for many of such plants either perish or thrive badly on their own roots when planted in the comparatively cold soil of Britain. They are, of course, affected somewhat injuriously by the coldness of our atmo-

sphere, but they are more than doubly so when the roots, upon which their supply of nourishment depends, are also in a colder medium than they are adapted to endure. When grafted on a stock, the roots of which are not likely to be injured in a properly drained soil by the lowest ground temperature which occurs in this country, tender plants, that can be properly grafted on such, thrive tolerably, in consequence of being fed by roots uninjured by cold.

In many cases the stock can be suited to the nature and condition of the soil and subsoil. The Pear, for instance, sends down strong roots to some depth; and in a wet subsoil, where they would be in a constantly saturated medium, they would perish. The Quince roots, on the contrary, extend near the surface, and thus avoid the too wet subsoil; it will also thrive in low situations that are liable to be occasionally flooded, where Pears on their own roots would not flourish.

Grafting may be employed with great advantage in bringing quickly into flower many kinds of trees and shrubs which, when on their own roots, do not commence bearing till they have attained a considerable age and size. A young plant might be twenty years before it formed a stem to support limbs, and these again branches or spurs for fruit; but by grafting a bud or shoot of it on to a tree having a bulk of stem and branches already formed, it is at once placed in the same condition as if it had been allowed to grow to that bulk of wood itself; that, however, requiring the lapse of some years.

MODES OF GRAFTING.

1. *Whip-grafting, or Splice-grafting*, is, on the whole, the most suitable mode, and the one most extensively employed in this country. It is represented by fig. 298, where A is the scion, B the stock. In each a cut surface is exhibited, showing the wood *aa*. The points at the extremities of the dotted line *a* and *a* touch the inner barks of both stock and scion, whilst the points at *b* touch the outer barks. It will be readily observed that the bark of the stock, because older, is thicker than that of the scion; consequently, if, as ought to be the case, equal surfaces of wood are exposed, the cut surface of the scion would not completely cover that of the stock, nor would this ever be the case, except when the barks of both stock and scion are of equal thickness. In proceeding to operate, cut the top of the stock in a sloping direction, terminating if possible above a bud, as at *d*. Then take the scion and cut it sloping from

above at *c*, and thin towards the end at *f*. The scion is now prepared. Then, proceeding to the stock, enter the knife at *g*, and cut a slice

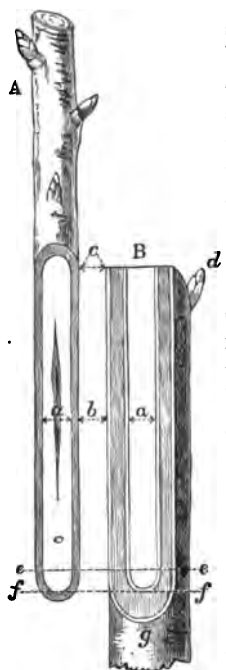


Fig. 298.—Whip-grafting

upwards to *c*, so that the surface of the wood shall be, as nearly as possible, a counterpart of the exposed surface of the wood of the scion. If this should happen to be the case by a single cut, so much the better, but if not, it should rather be too narrow than too wide; for, in that case, a shaving can be taken off till the cut face *a* of the stock equals that of the scion. The inner bark, indicated by the points at the ends of the dotted lines *aa* of the scion and stock, should be placed in contact, the parts secured by tying with matting or other material, and surrounded with clay, grafting-wax, or other substances, to exclude the air and wet.

In operating as above detailed, the principle to be kept in view is the coincidence of the inner bark of the stock and scion.

It is well to have a bud at the back of the cut face of the scion, near the lower part, as at *f*, fig. 298; for it sometimes happens that the scion is broken by wind, or otherwise accidentally injured, and in that case the only chance of saving the graft is by encouraging the bud *f* to grow. In making the sloping cut on the scion, it is advisable to insert the knife below a bud; for that bud will contribute to the healing of the wound in its vicinity.

The scion having been fitted as accurately as possible to the stock, tie it firmly but not too tightly by winding round it and the stock a strand of grafting-cotton or soft bast. This should then be covered with clay or grafting-wax; some preferring the one, and some the other. We shall suppose that grafting-clay is to be employed. In that case, take a little of it and rub it over the matting, squeezing it on rather closely, so that it may not readily part; then take a ball of the clay, larger or smaller, according to the size of the parts grafted, and put it round, tapering the ball at top and bottom, like an oblong spheroid. In working stocks near the ground, the soil in many instances can

be drawn up over the graft. This preserves the moisture in the clay, and consequently prevents the scion from being dried up before it unites, so as to drive sap from the stock. Failing this, the clay round the graft should be covered with moss, the latter being secured with matting, and kept moist in dry weather.

The scion usually pushes but slowly for some considerable time after it has been grafted; and whilst that is the case, there is little danger of the ligature becoming too tight. But when fairly united, the clay must be moistened and removed, and the tie loosened. It is frequently advisable to retie the graft less tightly; for the tissue at the junction will scarcely be adapted for withstanding exposure, and it will not have formed woody fibre enough to resist the action of the wind.

2. *Saddle-grafting*.—This is represented by fig. 299. It cannot be well performed except when the stock and scion are of nearly equal thickness. The stock A is cut sloping on both sides, like a wedge, terminating at c. The scion B is split up the centre, and each half is thinned to make it fit astride the wedge-like end of the stock. A thin narrow-bladed knife should be employed for this purpose. The inner bark of the scion and stock having been made to coincide as nearly as possible, the parts should be secured by a ligature, and covered with some grafting composition.

This mode of grafting is open to some objections. Unless the scion is cut out without splitting, there must be a rent, as from c to d, which will never unite, and is even liable to open and form a blemish. The operation requires more time to perform than whip-grafting; and, as already observed, it cannot be well employed unless the stock is nearly of the same size as the scion.

3. *Cleft-grafting* (fig. 300) is a common mode in some parts of the country, but it is nevertheless a very objectionable one. The stock is cleft with a chisel, or other instrument, at a; and the cleft is kept open till the scion is inserted. The scion is cut wedge-shaped, and inserted in the cleft, so that the inner barks may coincide. It is then covered with one or other of the grafting compositions, generally grafting-clay when the stock is large. In preparing the scion for inser-

tion, it is cut tapering towards the lower end, and made thin at the side intended to be placed towards the interior of the stock. There should

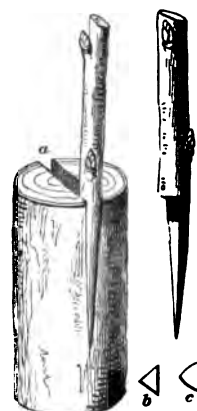


Fig. 300.—Cleft-grafting.

be no bark left upon the inserted part of the scion, except that on the outside; for, if any were left on the opposite or interior part, the sap descending by the inner bark of that part would find no substance with which it could unite. When the stock is thick, and requires considerable force to keep the cleft open, it is apt to pinch and bruise the inner bark of the scion, next the outside, if it is thinned with a straight slope from the back to the edge; for in that case, the whole of the pressure would be upon the part next the bark. The section of the scion should not be like a triangle, b (fig. 300), but like half an oval, c.

Occasionally when a large stem or limb is cleft-grafted, two scions are inserted, one as represented in fig. 300, and another opposite to it, in the end of the cleft next to a. In some cases the stock has been cleft across, and again transversely, so that four scions might be inserted. But cleft-grafting is a bad mode. It will be observed that there is an opening which extends from the insertion of the scion to the opposite side of the stock at a. This rent in the solid wood can never heal so as to be again solid. Instead of splitting the stock, it would be better to cut out a triangular groove in the side, and in that fit the scion, so that the inner barks might correspond, as in fig. 302. This last-mentioned plan is useful for renovating large fruit-trees by grafting upon the decapitated trunk or branches superior varieties. As a rule, however, it is better to replace such trees with plants from the nursery.

4. *Crown or Rind Grafting* (fig. 303) is much to be preferred to cleft-grafting, inasmuch as the wood of the stock is not rendered unsound by cleaving. It is easily performed; the lower end of the scion is cut sloping, as in whip-grafting; the head of the stock is cut over horizontally, and a slit a is made just through the inner bark. A piece of wood, bone, or ivory, in shape somewhat resembling the thinned end of the scion, is introduced at the top of the slit, between the alburnum and inner bark, and pushed down in order to raise the bark, so that the thinned end of the scion may be introduced without being bruised.

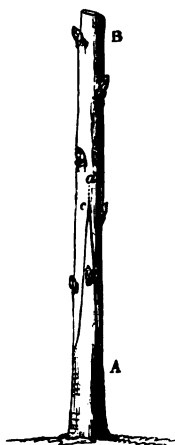


Fig. 299.—Saddle-grafting.

The edges of the bark on each side are then brought close to the scion, and the whole is bound with matting, and clayed. When the stock is



Fig. 301.—Cleft-grafting.



Fig. 302.—Triangular Notch-grafting.

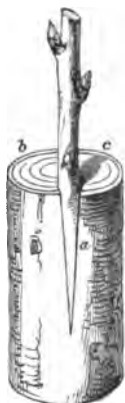


Fig. 303.—Crown or Rind Grafting.

large, in order that its top may be soon healed over, and in case of a single graft, *a*, failing, two others are introduced at *b* and *c*.

5. *Side-grafting*.—This is a modification of whip-grafting, and is performed in the same manner, except that the stem or branch, instead of being cut completely off, is notched to a greater or less depth according to circumstances, as at *b* (fig. 304). It is useful for supplying a branch, where one is deficient, on an upright stem, as at *a*; and for replacing the branches of a tree with others of a different sort, the original being allowed to remain till the grafts extend so as to nearly occupy their place. With this object in view, a notch is made near the stem, on the upper part of the branch, as at *b*, and a slice is taken off between the notch and the stem, as at *c*. The graft is placed there; when it pushes, the shoot must be trained horizontally, and as it extends,

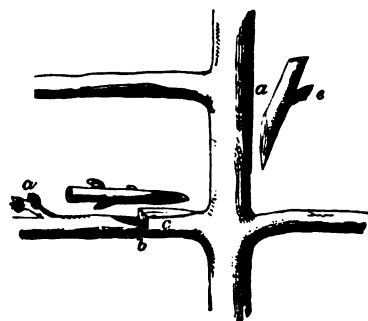


Fig. 304.—Side-grafting.

any growths or spurs that are in its way, as at *d*, should be cleared off. In the case of fruit-trees, the original branch notched in this way bears as well as if no such operation had been

performed, and sometimes even better. When the new branch has grown to a considerable extent, the original should be entirely cut off at *b*. In supplying a branch, as at *a*, the scion must be placed with a bud pointing outwards, and the shoot proceeding from it trained in a horizontal direction towards *e*.

6. *Herbaceous Grafting*, as its name implies, is applicable to plants, or parts of plants, that are in an herbaceous state. It has succeeded with the Melon, Cucumber, Cauliflower, Tomato, and Potato; and Dr. Maclean of Colchester grafted the white Silesian Beet and the red Beet on each other. Dwarf species of Cactus are very commonly grafted on tall ones; and *Clanthus Dampieri*, which so often perishes under cultivation when on its own roots, grows freely if



Fig. 305.—Herbaceous Grafting.

grafted in the seedling state on a seedling of *Colutea*.

7. *Herbaceous Grafting of Resinous Trees*.—This has been extensively practised in the forest of Fontainebleau and elsewhere in France. The mode of operation, as detailed by Du Breuil (*Cours élémentaire théorique et pratique d'Arboriculture*), is as follows:—When the terminal shoot of the stock *a* (fig. 306) has attained about two-thirds of its length, it is cut back with a horizontal cut to the point where it begins to lose its herbaceous consistence and commences to become woody. The young leaves are cut off between *a* and *d*, a distance of between $2\frac{1}{2}$ and 3 ins., leaving, however, about two pairs at the top *d d*, to attract the sap. Thus prepared, the stock is split down the middle to the depth of 1 inch or $1\frac{1}{2}$ inch. The scion *b* is cut wedge-shaped, and introduced into the split, so that the commencement of the cuts on each side of the scion may be nearly an inch below the top of the stock. The scion should be cut at the place where its consistence is similar to the part of the stock where it is to be inserted. Its

diameter ought to be as nearly as possible equal to that of the stock. The graft being placed, it is secured with coarse worsted, commencing the tying at the top and winding it down to the lower part. In the case of delicate species it is well to wrap paper round the grafted part as a protection against the drying action of the sun and air. The shoots at *c* are then broken at about $\frac{1}{2}$ inch from their bases. Five or six weeks after grafting, the cuts will be completely healed; the tie may then be removed, and the two portions *d* furnished with leaves at the top of the stock should be cut off, otherwise they might give rise to buds, which, in pushing, would weaken the graft.

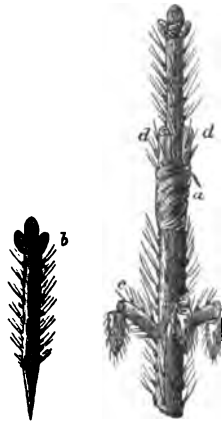


Fig. 306.—Herbaceous Grafting—Resinous Trees.

8. *Root-grafting*.—Many kinds of plants may be increased by root-grafting more quickly than by any other means when stocks are not in readiness.

It is conducted on the same principle as the grafting of stems and branches, already explained. When vegetation is at rest the roots ought to be severed from the base of the stem, and if the latter can be entirely removed so much the better. The cut end of the root should be raised nearly upright, if possible, so that the scion when put on may point upwards. The part of the root operated upon must then be washed, or otherwise freed from soil, in order that the wound may be clean. The graft should be tied and clayed to prevent wet from entering the wound; and the root ought then to be again covered with soil, which should also cover the grafted part, leaving only one or two buds of the scion exposed. When the graft pushes, the ligature must be loosened, as in the case of grafts above-ground. In grafting fleshy roots and tubers, such as those of the Dahlia and Pæony, the stock is cut in a triangular form, and a piece of exactly the same shape is fitted in. The mode is the same as that represented in fig. 303. Portions of root may be used as stocks; for instance, the garden varieties of Clematis are propagated by grafting young shoots in early spring on to pieces of root, a few inches long, of *C. Vitalba*, &c.

Grafting-clay.—This may consist of two parts clay, or clayey loam, and one part of cow-dung,

free from litter; but we have found from experience that some fine, tough, short hay, mixed and beaten up with the clay and cow-dung, is of great utility in preventing the clay from cracking and falling off. In fact, it answers the same purpose as hair in plaster. Some recommend horse-dung to be used instead of cow-dung, others part of both; but cow-dung is best for retaining moisture. It should be prepared several weeks before it is required by well mixing it and keeping it moist.

The grafting-wax generally used in this country is made as follows:—Rosin, 4 lbs.; tallow, 2 lbs.; bees'-wax, 1 lb. These are melted and well mixed, then poured into cold water and pulled with the hands till the whole is white and of the consistency of soft putty. The use of grafting-wax is to keep out air and moisture; and, provided it does that, the softer it is the better.

It is a question whether grafting-clay or wax is the better; some prefer the one and some the other. In grafting small and delicate plants clay cannot be well applied, and therefore it becomes necessary to use some kind of grafting-wax; but in the case of strong plants, such as fruit-trees in the open air, clay is preferable. It retains moisture for the benefit of the scion, whilst no moisture can be derived from the grafting-wax, and the scion is apt to be dried up before it has time to form a union. Cold dry weather may ensue after grafting, so that little progress towards forming a union can take place. During such periods the scions are enabled to retain their vitality by absorbing moisture from the clay. Again, it is well known that the bark of trees is not liable to be injured by contact with common earthy substances; its expansion is rather promoted than otherwise, a circumstance which is favourable to the flow of sap. Of pitchy substances, on the contrary, even not specifically injurious in their ingredients, the mere mechanical effects are bad. The French cold grafting-wax called *Mastic L'Homme Lefort* is an extremely convenient preparation, which is easily applied without being artificially heated, soon hardens when exposed to the air, is readily removed when necessary, and has been used with the best results in the most delicate kinds of grafting.

XI.—PROPAGATION BY BUDDING.

Budding is an operation by which a bud, together with a portion of bark, is removed from a plant, and inserted beneath the inner bark of another plant, or beneath that of the same plant;

for this is sometimes done where the natural buds do not push to form shoots at places where these are necessary. The main principle of budding is the same as in grafting. The union is effected by means of the organizable matter, or cambium, which exists between the alburnum and inner bark; and the success of the operation depends upon the abundance of that matter being such as to permit of the bark being easily raised from the wood. When both the stock, and the tree from which the bud is taken, are in that condition, the union is most readily effected. There are periods when the flow of sap is arrested, and then the bark adheres firmly to the wood, and when that is the case budding should not be attempted. Calm but warm weather is the most favourable; excessively dry weather with strong sun is apt to kill the buds, and wet weather proves injurious to them, unless they can be protected from rain; for, when the latter gets into the wound, it decomposes the sap, and organization cannot proceed so as to form a union.

Buds are generally inserted in July or August, in which case they remain dormant, or at least do not usually push into shoots, till the ensuing spring. The modes of performing the operation are various; the principal are:—Shield-budding or T-budding, inverted T-budding, square shield-budding, flute-budding or tube-budding, and annular or ring budding.

Shield-budding, or T-budding, is represented in fig. 307, where A represents the stock, and B B the bud in different positions. In operating, take a shoot from the tree from which buds are to be worked, and immediately cut off the leaves at half the length of the petioles. Make a transverse incision *a* in the stock A, and from the middle of this make a longitudinal one, *a b*. A bud should next be removed from the shoot, by taking the latter in the left hand and entering

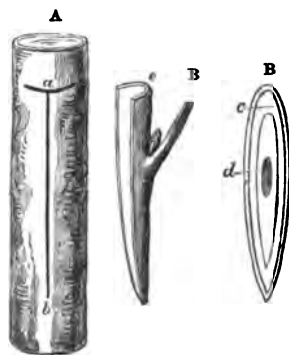


Fig. 307.—Shield-budding.

the knife about $\frac{1}{2}$ inch below the bud, more or less according to the size of the stock and of the shoot; with a clean sloping cut pass the knife upwards and inwards till under the bud, and then slope outwards so that the eye may be nearly in the middle of the piece or shield thus detached,

or rather nearer its upper end. In doing this, the knife will necessarily cut off a portion of the wood along with the bud, this is usually removed; to do so, turn the cut surface upwards, holding the piece between the forefinger and the thumb of the left hand, enter the point of the knife between the inner bark and upper extremity of the wood at *c*, raise this extremity a little, so that it can be laid hold of between the point of the knife and the edge of the nail of the thumb, and then, with a sort of twitch, remove the wood. When this is done, see that along with the wood, the base, root, or core of the bud, as it is variously termed, is not also removed. If this come along with the wood, leaving a hole at *d*, the bud is not likely to succeed, and another bud should be taken off more shallow, so that the portion of wood to be removed may be very thin. The base of the bud at *d* is greenish and of a pulpy herbaceous nature; it is, in fact, the commencement of the medullary sheath, the upper extremity of which is terminated by the growing-point. If the wood comes clean out, with the exception of a few slight woody fibres connected with the lower part of the base of the bud, these need not be removed, the tissue on the inner bark being liable to be bruised.

The bud is now ready for insertion. With the ivory handle of the budding-knife, raise the bark of the stock A at each side of the incision *a b*, commencing at the corners immediately below the cross cut at *a*. In raising the bark, the handle of the knife should never touch the portion of cambium lying on the alburnum, but, to avoid doing so, should be slipped along, pressing against the inner bark. In short, the handle of the knife must not be used like a wedge forced in between the wood and bark of the stock. Mr. Knight frequently dispensed with the knife-handle; in raising the bark he merely lifted it between the blade of the knife and edge of the thumb. When the bark is sufficiently raised to admit the bud, take the latter by the petiole and gently introduce it with the assistance of the ivory handle. Let the part *e* of the shield be at the cross cut *a* of the stock, and, keeping the bud steady with the thumb of the left hand, cut off the top of the shield, so that it may fit closely to the upper edge of the cut at *a*. The bud or shield must not be forced down like a wedge; on the contrary, it should be introduced so as to touch the cambium of the stock as little as possible, till its inner bark, and the cambium adhering to it, can be directly applied to that of the stock; these coalescing, organization proceeds, and, circumstances prov-

ing favourable, a union is soon effected. The operation, to be done well, should be done quickly, for the organizing tissue is very delicate, and soon becomes vitiated by exposure to the air; therefore the least possible delay should take place between the raising of the bark and the application of the bud. If exposed for some time to the full influence of the air, the cambium would become brown, and form a species of thin dead bark; and, although this may serve to protect fresh tissue that may be forming under it, yet it cannot unite with living tissue placed in contact with it.

The bud, after having been inserted, must be bound in with fine matting or worsted; and, in doing this, care must be taken not to shift the bud in any way that would cause friction, and so injure the tissues below it. In tying, commence below the end of the incision at *b*, and pass the tie closely round as far as the bud. The shield ought here to be pressed close, in order that the base of the bud *d* may be close on the alburnum. This should be done with the fingers, without, however, injuring the bud; and whilst the shield is thus kept particularly close to the stock at that part, the tie should be brought round tolerably close to the under side of the bud, and the next turn must be wider, so as to clear the point of the bud, and allow it to peep out between the turns of the tie. Continue binding closely, and so that one of the turns may embrace under it the cross incision, the top edges of the raised bark, and the upper edge of the shield, which, as already observed, should be close to the sound bark of the stock at the cross cut *a*. Make one or two turns more, and draw the end of the tie under the last turn to fasten it. The operation is now completed.

In some cases it is advisable to shade the buds from the direct rays of the sun. In the course of two or three weeks, it will generally be seen whether the buds have taken or not. If the portion of the petiole drop off, it is a sign that the bud has taken; if, on the contrary, it wither or adhere, it is an indication that the bud is either dead or dying. As soon as it is ascertained that the buds have taken, the ties should be loosened, and these indeed ought to be frequently examined, in order that they may be slackened and retied, if they are becoming too tight, in which case they would gall the budded part.

In the following spring, say March or April, the head of the stock must be cut back to within a few inches of the bud. This stump should also be cut back close to the bud, after the latter has pushed a shoot having suf-

ficient foliage to receive the flow of sap, but previously the stump will serve as a support to which the shoot from the bud can be secured. In some cases the head of the stock may even be cut off before winter, but this is not advisable if the bud is so prominent that, if the winter should prove mild, it would be liable to push too much

before spring, in consequence of the bud being the only point of attraction left for the movement of the sap. When there is no danger of this occurring, the stock may be headed back immediately after the fall of the leaf, and the consequences will be a stronger shoot from the bud in the following season.

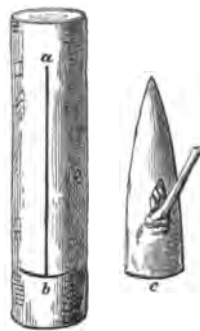


Fig. 308.—Inverted T-budding.

Inverted T-budding.—In this mode (fig. 308) the transverse cut is made at *b*, and the longitudinal one is commenced at *a*, in preference below a bud, and is continued down to the transverse cut *b*. The bud, having been inserted, is cut across at *c*, to join exactly the section *b* of the stock, and is afterwards treated as in shield-budding.

Different opinions are held as to the comparative merits of the two modes of T-budding. In the south of France the inverted one is preferred for the propagation of the Orange-tree,

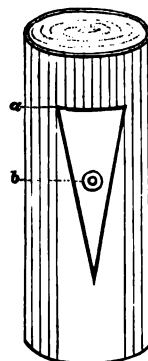


Fig. 309.

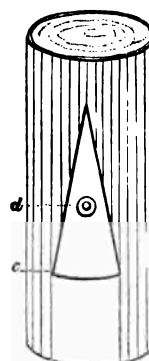


Fig. 310.

and is said to be more successful. Its success appears to depend on whether the bud derives its supply of nourishment from sap having an ascending or a descending movement. Let fig. 309 represent T-budding, and fig. 310 inverted T-budding. In the former *a* is the cross cut, and *b* a point where the base of the bud is situated; in the latter the corresponding parts are

marked *c* and *d*. The parallel lines represent in both figures the downward course of the returning sap. Now, it will be seen that the direct course of the returning sap is interrupted by the incision *a*; and until its communication is restored over the space *a b*, the base of the bud *b* is twice as far from the continuous downward channels as the bud *d*. In fig. 310 the two sides of the triangular space, from which the bark has been raised for the insertion of the bud, are exposed throughout their whole length to the course of the returning sap, and the latter can therefore soon flow to the centre of the space. This being the case, inverted T-budding may frequently be found the preferable mode of the two.

Square Shield-budding consists in merely cutting out a square patch from a strong branch or stem, *a* (fig. 311), and a similar piece, but furnished with an eye, from another strong branch, *b*. Having been exactly fitted, it may be covered with a piece of paper, pierced with a hole for the eye, or adhesive plaster will answer exceedingly well. This mode is sometimes adopted for spring-budding trees having thick bark. It has the advantage of covering exactly, with the inner bark of the piece containing the bud, the whole of the alburnum laid bare; but in T-budding this is impossible, as it is indeed with any method in which the shield is introduced below the bark.

Flute-budding (fig. 312) is so named from the parts being made to fit like the top of a flute. A cylinder of bark is taken off from an even part of the stock at *A*, and is replaced by another cylinder at *B*, furnished with buds, and made to fit close to the sound bark of the stock at *c*. It only requires a slight bandage to cover the junction of the barks at *e*, and a cap of soft adhesive plaster to keep out the wet and to prevent evaporation at top. Walnuts and other thick-barked trees are propagated in France by this mode.

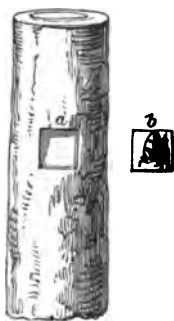


Fig. 311.—Square Shield-budding.

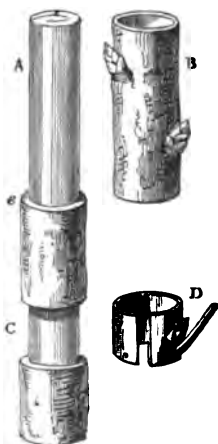


Fig. 312.—Flute and Ring Budding.

Ring-budding.—In this a ring of bark is taken off at any convenient part of a stock or branch, as at *C* (fig. 312). From another shoot or branch, a piece, *D*, of the same dimensions as that removed from the stock, is traced by two circular incisions, and a longitudinal cut made between the two circular ones permits the piece to be taken off and applied to the stock. The piece *D* should be taken from a part somewhat wider than the stock, for when found too wide on application at *C*, the edges can be pared till they just meet when the piece is brought tightly round. A bandage, leaving an opening for the bud, is applied, and the operation is completed. It will be observed that budding by this mode can be performed without cutting off the head of the stock.

Shield-budding with a portion of Wood, or American Shield-budding.—This does not differ from the common method, except that the slice of wood is not removed from the shield. The latter should be cut off rather thin, with a very sharp knife, and immediately inserted and bound up in the usual way. This mode answers well for spring-budding fruit-trees, Roses, &c., the shoots being taken off, as in the case of grafts, and eyes selected that are disposed to push and make a shoot in the course of the summer. It is also used in summer, when the bark does not easily separate from the wood, and when budding must nevertheless be proceeded with. If buds inserted at the usual time and in the ordinary mode are seen to fail, wooded shields may still be employed with a chance of success. According to Downing, this method, which he terms the American variety of shield-budding, is found much preferable to the common mode for the American climate, in which many trees, and especially Plums and Cherries, nearly mature their growth, and require to be budded, in the hottest part of summer. The operation can be performed with less skill than is required to remove the wood from the shield, is performed in much less time, and, observes that much-respected author, is uniformly more successful.

XII.—PROPAGATION BY INARCHING.

This mode of propagation, which is also called *grafting by approach*, depends on the same principles as grafting; in the latter, however, a part is entirely detached from a plant, and placed so as to grow upon another part; whilst in inarching, both parts are nourished by their own roots, and thus co-operate in forming a union. In woods and thickets branches of trees have fre-

quently been observed to be united, but this only occurs when the barks of contiguous parts are bruised or fretted, so that the alburnums can come in contact.

Inarching was formerly more employed for uniting two or more trees for picturesque effect than for the purpose of propagation. In rustic gardens, for instance, doorways were formed by planting two trees of the same kind, one on each side of the intended entrance; these were trained upright to the desired height, and then their tops were bent to form a Gothic arch, and united where brought into contact, so as to form but one head. Trees to form arbours, &c., may be so united, or the stems of several trees may be inarched to a central one, which may ultimately be rendered independent of its own stem and roots. But inarching is now chiefly employed for propagating such exotic plants as cannot be readily propagated by other means.

There are various modifications of inarching, all nevertheless depending on the principle of bringing the cambium of the individuals into contact. The simplest mode is represented in fig. 313, where A is the stock, B the plant to be inarched upon it. The two may be planted and growing in the ground, one of them may be growing in a pot, and the other in the ground, or both may be in pots, but in each case the mode of proceeding is essentially the same. At a convenient place where A and B can be brought in contact, as between *a* and *b*, cut off corresponding slices from each; then bind the parts together, and clay or otherwise protect, as in grafting. The stock may be allowed to remain at full length, or it may be cut back to *c* or *d*, and afterwards to *a*. When the two have formed a union, B may be separated from its own roots, by cutting it off in the direction of *b*, thus leaving it wholly dependent for support upon the roots of the plant A. Before this final separation is made, it is advisable to wean off gradually the portion *b**e* from its original source of nourishment, by making an incision below *b*, deepening it from time to time, till at last there is but little communication left between B and its proper roots, when that little may be cut off without causing any material difference to the inarched part *b**e*. Instead of diminishing the connection between the inarched part and its

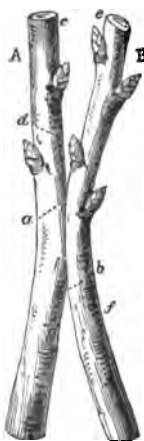


Fig. 313.—Inarching.

own roots, by gradually cutting in at or below *b*, it is a good plan to take off a narrow ring of bark, when the nature of the plant will permit. This may be done by degrees as the union is effected. The sap will flow upwards, through the vessels of the alburnum, to nourish the parts above *b*, but the returning sap will be checked when it comes to the ringed part, and must then direct itself with greater force towards the junction, and will consequently flow down in greater quantity by the liber of the stock A. Now it cannot do so without forming a proportionally greater quantity of alburnum as it descends; and by the vessels of the alburnum so formed sap will be conveyed upwards to the source of their origin in B. If buds are retained on A, with the view of maintaining the necessary amount of circulation in the stock till that can be done by B, care should be taken to check the shoots that push from them; for if allowed to grow vigorously, they would attract the sap from the part B. On referring to the figure, it will be observed that on the separation being effected at *b*, there must be a heel left at that place, which will take some considerable time to heal over.

Inarching is sometimes done with a tongue, but in any case it does not form so nice a junction as whip-grafting, where, in consequence of the lower end of the scion being made thin, there is scarcely any equality.

The stems of young trees are frequently in-

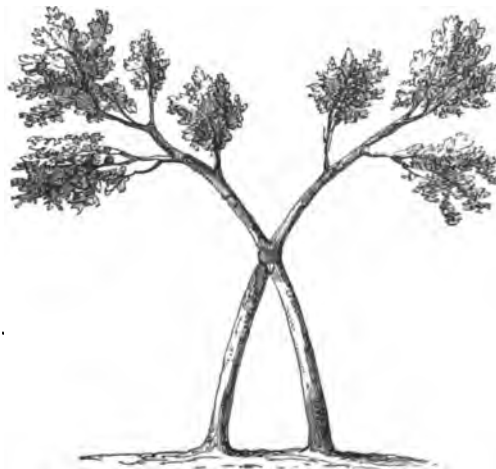


Fig. 314.—Sylvan Inarching.

arched, so as to form a lozenge-shaped trellis-work, or an arch, as in fig. 314. Summer shoots may also be inarched on shoots of the same age, or on a stem or branch several years older than themselves. In this way branches

which have died or become diseased may be readily replaced by others. The parts to be united should be firmly bound and held securely to prevent friction by wind. If the bark is removed from the parts to be placed in contact, the union will be all the quicker. Novel arbours have been constructed by planting a number of young trees in a circle, then bending them over and binding them firmly together at a height of about 12 feet. Ultimately they unite and appear to be one tree.

CHAPTER XX.

TRANSPLANTING.

NEED FOR TRANSPLANTING—PLANTS WHICH BEAR IT—
THE BEST SEASON FOR IT—HOW TO TRANSPLANT.

Transplanting is an important operation in the cultivation of trees and shrubs. It is seldom possible for perennial plants to be grown from seed, or even from very small specimens, on the spot they are to occupy permanently. Most gardens are furnished and replenished with plants raised in nurseries, and such plants, as a rule, are of sufficient size to produce an immediate effect, and may be five, ten, or fifteen years old. For trees or shrubs like these to be moved safely, transplanting will have had to be done two, three, or even more times during the previous life of the plant. Then alterations, re-arrangements, and improvements in gardens may render necessary the transplanting of even large specimens. The operation, therefore, is not only one that has to be continually practised, but the health and welfare of almost every plant in our gardens, parks, and woods is, or has been, dependent in a great measure on its proper performance.

Trees and shrubs vary a good deal in their capability of bearing the root-mutilation that transplanting necessarily implies. Some will scarcely bear it at all, as, for instance, the common Gorse; such plants have, consequently, to be grown in pots, or seed has to be sown on the ground where the plants are required. Others, like most of the deciduous members of the Rose family, bear transplanting without showing any ill effects. Generally, however, transplanting is in itself an evil, although a necessary one. Provided a tree is in its right position and in proper soil it is better left alone. That, however, is merely an academic view of the matter. The operation is an unavoidable one, and what we have to consider is the best

way of doing it. Fruit-trees of over-vigorous growth may often have their fruitfulness increased by transplanting, but this, of course, is merely a form of root-pruning—an operation that is treated upon in the chapter on *Pruning*.

In transplanting, every care should be taken to preserve as many as possible of the true feeding-roots of the plant. These are not the thick, woody portions, whose functions in the life-history of the plant are to serve as holdfasts or anchors, and to act as conduits through which food-matter is conveyed from the root-system to the leaves; the real working portions are the tips of the finest ramifications, and it is these, or the fibres from which they immediately spring, that it should be the aim to preserve. However carefully the work is done these delicate root-tips are more or less injured, and a plant's capability of bearing transplanting well, or the reverse, largely depends on its power to quickly renew them.

The question as to which is the best season for transplanting depends in a great measure on the plant itself. If plants are small enough, or develop the roots compact enough to hold the soil in which they are growing in a "ball" to be removed along with them, there is scarcely any season of the year at which they may not be moved with safety. Rhododendrons and allied plants whose roots form compact balls are cases in point. Of course this does not mean that they can be transported long distances by rail, &c., but that where they are not out of the ground long enough for the roots to dry, such plants may be shifted even in mid-summer. It is not, however, in connection with plants like these that the real problem of transplanting arises. They are simply taken from one place to another, with the whole root-system, and the soil it occupies, intact. It is when, owing to the size of the plant, or its way of rooting, or perhaps the distance it has to travel, little or no soil can be taken with it, and the roots are not only torn and injured, but also much reduced, that the time as well as the method of transplanting become important.

Deciduous trees and shrubs, as a whole, can be moved during the period when they are destitute of foliage—say from October until March. Even after they have started growing they can be shifted safely, provided they are watered during any dry time that may ensue. On the whole, October and November are the best months. At this period the weather is usually moist and warm, and the plants get thoroughly settled in the ground and the roots

callused over by the following spring. This applies to most deciduous trees and shrubs, either ornamental or fruit-bearing. Still, there are exceptions. Magnolias, for instance, which make long, thick roots, and so are difficult to remove without root-injury, are best transplanted in May, just as evidences of new growth appear. If transplanting is done in late autumn or in winter, the roots do not callus then but decay at the injured parts, whereas in May the wounds callus over comparatively quickly.

The question as to when is the best time to transplant evergreens has for many years been a matter for discussion. Plants like Rhododendrons, that make compact masses of roots, for reasons already stated are not in question. It is the evergreens that have long been standing in one place, or those that do not naturally produce closely-matted fibrous roots, about which the difficulty arises. Some authorities recommend one date, some another, but in our opinion there is no doubt that late spring is the best time, autumn the next best. Evergreens, it must be remembered, are never so stagnant at the root as deciduous plants are. Neither evergreens nor deciduous plants grow in winter (that is, using the word in a general sense), but the former are continually transpiring from the leaves, and there is, in consequence, a constant, if not a large, demand on the roots for moisture. If evergreens are robbed of the working portions of the roots at a time when growth has stopped, the water-supply naturally stops also, and there is no chance of its renewal until growth recommences and new roots are emitted. The reason becomes evident, therefore, why plants with persistent leaves should only be disturbed at the root either before growth has ceased in autumn or after it has recommenced in spring. At the latter season sufficient indication is afforded by the bursting of the buds, as a rule about the beginning of May. Late autumn and winter are, consequently, unfavourable seasons because of the long time that has to elapse before growth recommences. An early spring month like March is also bad, because the greater sun-heat and the drying winds of that month render transpiration more rapid. It is, in fact, during March and April that the first symptoms of failure appear in plants that have been moved too late in the autumn. September is a good month; also October, if the weather keeps open and mild; but April and May are probably the best.

The very best time to move Hollies is about

the first week in May, but a week or two either way does not matter, especially if the weather is showery. It is a good sign if Hollies drop a good proportion of their leaves soon after transplanting; if they turn brown and hang on the branches, the plants are, in nine cases out of ten, doomed. It is not safe to move evergreen Oaks till well into May. Early June even is a better time than April. Hardy Bamboos, again, ought never to be disturbed and broken at the root until young foliage begins to unfold in May. Autumn even is not a good time to transplant them, but with due care they may be safely transplanted from May to July.

Deciduous plants that must be moved in early autumn, or at any time before the leaves have fallen, have a better chance of recovery if the foliage is wholly or in great part stripped off. If the roots have been much injured the younger branches are apt to shrivel when the leaves are left on, and a serious check is given to the plant. But if the natural fall of the leaf is anticipated, the balance between the root-system and the transpiring surface of the plant, or, in other words, between supply and demand, is still maintained. The same theory holds good in regard to evergreens, but in this case it is better to prune out a proportion of the branches themselves rather than to strip them of their leaves.

It is important to bear in mind that the frequent (*i.e.* biennial or triennial) transplanting of all young trees and shrubs makes safer their final removal into permanent positions. This is more especially the case if they have to travel long distances with little or no soil attached to their roots. It is in the attention paid to this matter that the chief difference between a well- and an indifferently-managed nursery shows itself. Frequent transplanting is attended with considerable labour and occasional losses, and naturally adds to the cost of trees and shrubs so treated. Yet such plants are much the cheaper in the end. One of the commonest mistakes made by bodies who have the management of public parks and gardens, and which consist usually of persons having little or no intimate knowledge of horticulture, is in purchasing plants at a low price that have been neglected in this matter. Such plants appear to the uninitiated to be better and more vigorous than the others; and so they are, if they had not to be removed. They cannot, however, bear transplanting anything like so well as the short-jointed, sturdy looking plants that have had proper nursery treatment. The

latter give in the end the greater satisfaction, and the cost is ultimately smaller, for the number of failures is often fifty per cent less. The value of frequent transplanting in the nursery is in its preventing the formation of long, thick roots extending so far from the stem that they have to be cut off when the plant is lifted, and because it also promotes the development of an abundance of the true feeding or fibrous roots close to the stem, which it is easy to save and carry away with the plant. For the same reason the following plan (if time permits) is a good one to adopt when about to transplant trees of large size that have long been undisturbed at the root:—A winter or two before the tree has to be moved a trench is dug all round it at a suitable distance (dependent, of course,

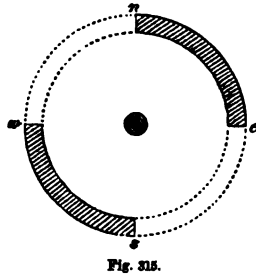


Fig. 315.

on its size) and as deep as the roots extend. All the roots are cleanly severed with a knife, and the trench is then filled again with the same or, if necessary, better soil. A season or two will allow of the formation of a great number of fibrous roots, and the ultimate transplanting of the tree is rendered much safer. In the case of old or particularly valuable specimens it is sometimes advisable to adopt the plan indicated by the accompanying diagram (fig. 315), that is, if their removal is decided upon a sufficient length of time beforehand. To lessen the check, half the roots only are severed one season, the other half the next. A circle is drawn round the tree at the proper distance, and it is divided into four quarters or sections. In two opposite quarters—those represented in the diagram by the shaded portions—the trench is dug to the necessary depth and the roots severed. The year afterwards the two remaining quarters are treated similarly.

When a tree or shrub has to be transplanted, it will be necessary to remove it with or with-

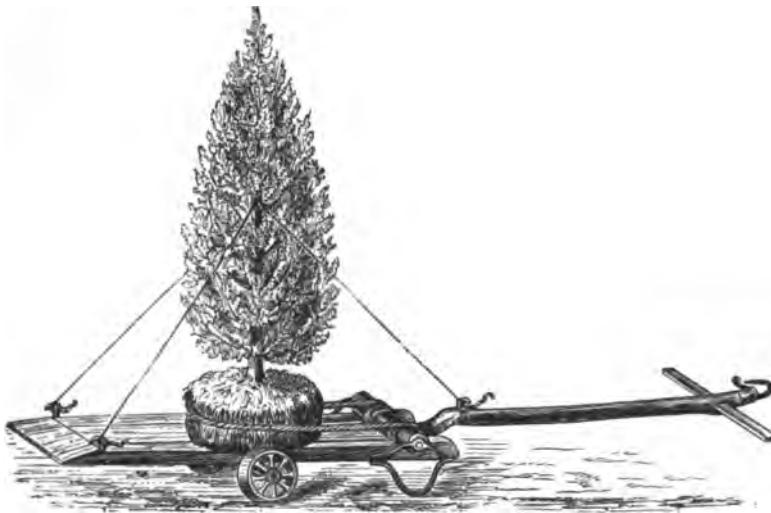


Fig. 316.—Transplanting Carriage.

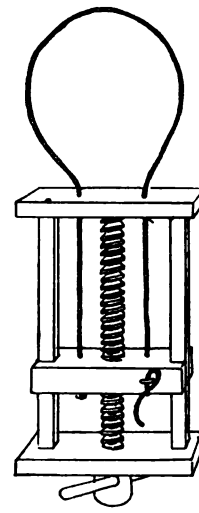


Fig. 317.—Tourniquet.

out a ball of soil. In the former case the weight of plant and soil may be anything between a few hundredweights and four or five tons. The difficulty arises not so much from its weight as its unwieldiness, and the importance of preventing it from breaking. Although the plan of carrying soil along with the roots is more costly and troublesome, it is much safer; and it is with a view to enabling planters to adopt it for large specimens that various transplanting machines have been devised. It would be tedious and of little value to attempt to describe the mechanism and

working of these implements. Two of them are illustrated here, and their mode of working is in each case easily understood from the drawing. Fig. 316 represents a useful carriage for transplanting trees and shrubs of moderate weight. The ball after being reduced as much as is desirable is tilted carefully on one side, the bevelled end of the machine is then pushed under as far as possible and the ball drawn on to the centre by means of the pulley arrangement shown. The wheels should be made broad, and preferably higher than those shown in the figure. The operation resolves itself into two

distinct processes, viz. the preparation of the ball and the lifting and transporting of it to the new quarters. Balls of soil weighing 1 ton or less are best made circular, so that they can be bound up with stout canvas and cords. Between the cords and the canvas a few thin narrow boards are necessary to prevent the cords cutting into the soil. They may be



Fig. 318.—Method of using Tourniquet.

tightened by making a loop at one end, and whilst one man is pulling at the cord another may be tapping the boards close in to the ball. It can be made firmer and safer by tightening the cords by means of a *tourniquet* (figs. 317 and 318). As affording some indication of the weight of a ball of earth, it may be mentioned that a cubic yard of soil averages roughly about 1 ton. When the tree is so large that a mass of soil 5, 6, or 7 feet in diameter has to be moved, the ball is best made square, as it will be necessary to roughly enclose it with boards.

Large transplanting machines (see figs. 319 and 320) are only really needed in large gardens, or where extensive alterations necessitate the removal of a large number of trees. Much can be done with a few planks, rollers, and other implements common to the garden by workmen of intelligence and average ingenuity. We are, indeed reduced to such simple accessories when large shrubs like *Rhododendrons* have to be moved. The large spreading tops prevent the employment of any of the machines in common

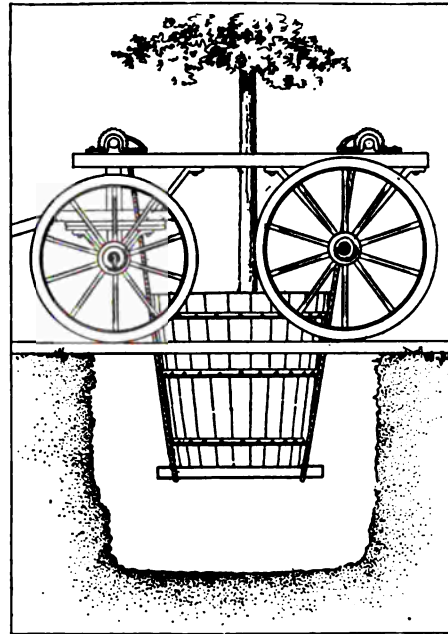
use. The removal of very large trees and shrubs is, however, somewhat out of the ordinary routine of garden work. The vast majority of trees and shrubs are taken out of the ground and carried to their new quarters with no more soil than clings naturally to the roots, and it is to the best way of treating such plants that a few words may now be devoted. We have already referred to the importance of preserving as much as is possible the fibrous portions of the root-system. Some plants can, of course, be removed safely if most, or even all, of these fine roots are cut off, but they are exceptions, and even they would be better with the fibres left on. When large specimens have to be removed, if no apparatus is available to enable them to be transported with a ball of earth, the best way is to dig a trench round the tree at a suitable distance and gradually and carefully break away the soil inwards to the trunk. As the roots are bared they should be carefully preserved from injury by tying loosely in bundles. If the process is a long one, the exposed roots ought to be prevented from becoming dry by covering them with a damp mat or something of the kind. All severed or badly bruised roots ought to be cleanly cut with a knife.

Whilst the hole into which the plant has to be placed will naturally be proportionate to its size, it should be remembered that the larger it is the better. A transplanted tree will always thrive better in ground that has been thoroughly broken up. Ground that is to be occupied by new shrubberies or closely-planted groups should always be deeply trenched beforehand. Even in soil that has been so treated the holes should always be large enough to allow of all the roots being laid out their full length and in their natural positions. Any doubling back of the roots is very objectionable. The hole should be no deeper than will allow of the uppermost part of the roots being covered about 2 inches. Too deep planting is especially to be avoided on heavy land. After a plant has been stood in its place, its roots should be first covered with soil fine enough to be worked into all the interstices between the fibres. The plant, if small enough, may also be shaken slightly to further this end. The amount of treading or ramming necessary depends on the nature of the soil. If light and sandy, it needs more ramming than wet heavy soil, which is apt to set hard. Nothing is better for settling the soil about the roots than a good watering.

This is best done before the hole is quite filled.

In positions exposed to strong south-west (or other prevailing) winds, a tree should, when planted, be made to lean slightly towards the exposed quarter. Many new-planted trees require some support during the first few months, until the roots have got hold of the new soil. A common method is to drive a stake into the ground near the stem, and then

tie them together. This system has its disadvantages. Roots are liable to be injured in driving down the stake, and during winds the stem is apt to chafe against the stake and thus start a wound unless some soft material is placed between them. A good plan to give temporary support is to use three guy-ropes (thick, soft cord is best), attached to three pegs firmly driven in the ground. Where the branches come within a few feet of the ground,



Figs. 319 and 320.—View and Side Elevation of Transplanting Machine for Trees of large size. The mass is raised by means of iron crowbars which fit into sockets in the rollers around which the lifting-ropes are wound.

three or more of them may be tied to stakes driven in at equal distances round the tree, several feet away from the trunk.

Tools for transplanting, such as picks, mattocks, &c., are dealt with in the chapters on Tools. [W. J. B.]

CHAPTER XXI.

PRUNING.

PRUNING OF LARGE TREES—OF OLD OR SICKLY TREES
—OF SHRUBS—ROOT-PRUNING—RINGING.

The operation of pruning may be performed either to reduce or restrict a tree or shrub to some desired size or shape, to regulate the

quantity and quality of the flowers or fruit they bear, or to improve the health and increase the vitality of old or sickly trees. These objects are simple and self-evident; yet it is a fact, that of all the arts in horticulture pruning is the one most misapplied and misunderstood. It would be correct to say that the hacking and clipping which is so frequent in gardens is not pruning at all. Often done without any regard to the habit of the plants or their time of flowering, its only purpose is to keep them to some arbitrary shape quite regardless of their natural form. Although pruning is a purely artificial process, it is based on one of Nature's laws. Superfluous branches are cast off or starved out of existence by trees

and shrubs when wild. In Nature every plant, and often every part of the plant, has to fight for a place among its fellows. In the garden this is not so. The cultivator's aim is to provide each plant with the conditions that will develop those qualities which he most desires, and by removing adverse influences, to enable it to devote its whole energy to his own ends. Of all the processes employed in horticulture to bring about this object, pruning is the one perhaps that most needs the exercise of thought and intelligence and an acquaintance with the nature of the plant on which it is employed. Good pruning may immensely improve the beauty or usefulness of a plant, but it is infinitely better to leave it alone than to prune it badly.

It has been said that pruning should be done with the thumb and finger, meaning thereby that the careful cultivator prevents superfluous and objectionable growths by pinching them out as soon as they appear. A great deal can be done in this way, no doubt, but the amount of attention such a method would entail in a large garden is beyond our reach, an annual overhauling being usually all we can accomplish. The theory of such a statement is, however, sound, and attention to the plants from the first would no doubt result in quicker development and a considerable gain in other respects.

If we consider for a moment we see how untenable is the position of those who hold that no tree or shrub should ever be touched with knife or saw, on the assumption that every plant, if let alone, will attain a truer beauty than human skill can endow it with. In the garden, at any rate, this does not take place. Cripples come in the plant world just as they do in the animal world, and it is as illogical to allow a tree to grow stunted, ill-balanced, or deformed as it would be to allow a child to grow up with crooked legs which straps and splints would straighten. Our gardens, too, are in these days furnished with trees and shrubs from every temperate region of the globe. Thus hundreds of species which in their natural state grow under every variety of conditions which mountain and plain, forest and stream, or climate can afford, are brought together in one place, where the conditions are fairly uniform as regards climate, soil, and rainfall. The effects of this are seen in every garden, trees and shrubs developing irregularities in habit, size, &c., which, unless corrected in time, would render them unsightly. It is in

counteracting the influences that produce these defects that the value of pruning greatly consists.

Pruning of Large Trees.—The pruner's aim with regard to those ornamental trees and shrubs which are grown not so much for beauty of flower as for beauty of leaf and habit, should be to help them to attain the greatest beauty

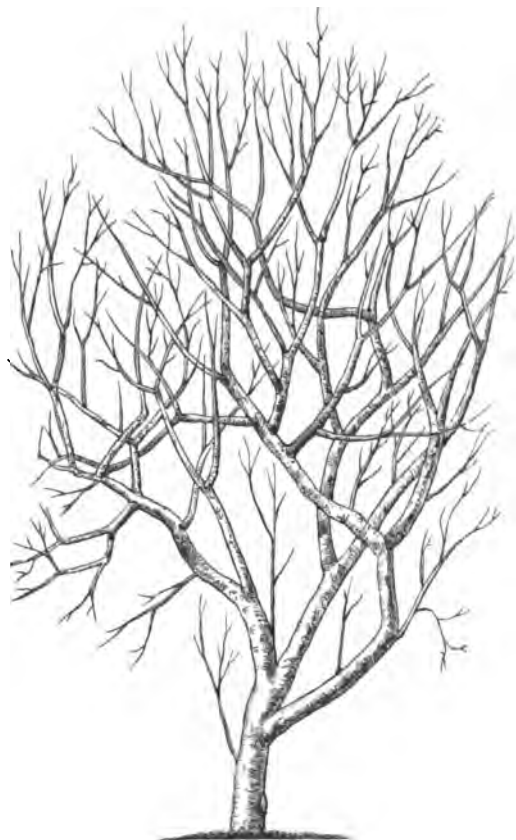


Fig. 331.—Example of Young Tree that has never been pruned.

of form without deviating from their natural shape and habit. The two great enemies of large trees are storms and parasitic fungi. The best way to guard against the first of these is to so control the building up of the tree that it will best withstand their effects. Experience has shown that lofty trees are safest when the main trunk is straight, erect, and undivided. The highest trees known, such as the Conifers of California, the Eucalyptuses of Australia, and the Palms of the tropics, have trunks of this description. A tree whose trunk forks low down, so as to divide the head of branches into two or more parts, is very liable, in an exposed position, to split in the fork owing to the swaying of the separate parts set up by winds.

When once this has started, the decadence of the tree has commenced, for moisture enters the opening, and fungi and decay attack the very heart of the tree. It follows, therefore, that in the pruning of trees the predominance of the lead should be maintained by shortening back all rivals as long as the tree is under control. That is the first consideration. If the proper lead has been destroyed or broken it should be replaced by tying up the nearest and most suitable lateral to form a new leader, or by shortening back the top of the tree to a whorl of branches and waiting for a new lead to grow. The latter method is best for many Conifers.

But even when a proper lead has been secured, some trees, owing to adverse influences of soil or climate, seem more inclined to keep low and spreading than to develop into tall, stately specimens. It then becomes necessary to shorten back the side branches, and probably to entirely remove some of them, so that the vigour of the tree is directed into the lead. This should, if possible, be done whilst the tree is young, for when the foundation of a clean, straight trunk has been laid at that stage, and a well-defined lead obtained, little further attention is necessary. It is surprising how even old trees will respond to the same treatment. We have seen Oaks which, having become stunted and full of twiggy growth, had to all appearance reached their full height, increase their stature by several feet in a few years under the stimulus of judicious pruning.

The proper shape for a young tree of the common type of growth is that of a rather narrow pyramid. As the tree gets larger, the diameter of the tree increases in proportion to the height. Finally, when the main stem shows promise of maintaining its ascendancy until the natural height of the species is reached, the tree may be left to develop itself. Figs. 321 and 322 show two trees, one of which has been neglected, the other having been attended to whilst young.

In a state of nature the lower branches of round-headed trees, such as the Oak and Beech, mostly die and fall away as the tree increases in height. Under cultivation it is a good plan to anticipate Nature and to remove them with knife or saw. This prevents the formation of ugly dangerous snags on the trunk. As a rule the bare portion of a trunk should be about one-third of the entire height of the tree. This, however, is a matter that depends on the

character of the species and on the form of tree desired; nor need it preclude those charming effects in gardens where the branches of trees are allowed to rest on the ground. It should be borne in mind that whilst pruning enables the cultivator to promote the development of wood where it is most needed, and to prevent

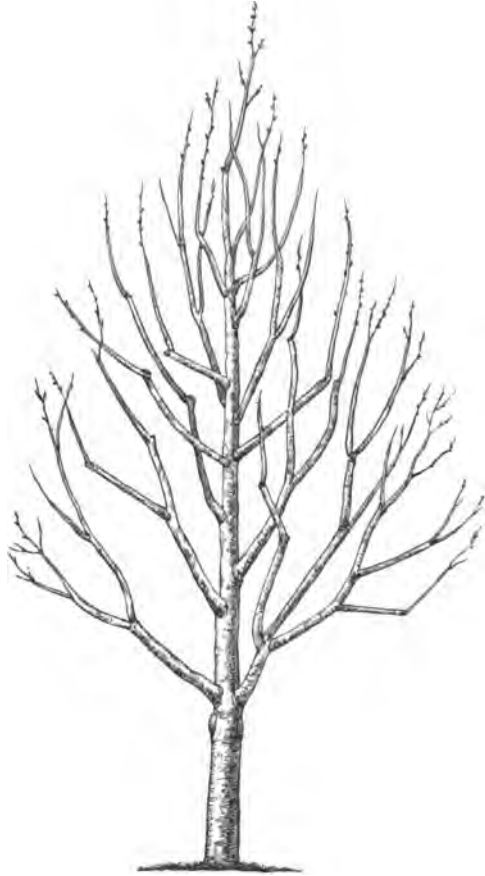


Fig. 322.—Example of Young Tree kept in shape by pruning.

the formation of useless and unsightly branches, the building up of all woody parts is directly dependent on the amount of leaf surface. A weak, lanky growth, unable to support itself without staking, may result from too hasty a removal of the lower branches or a too severe thinning of the heads of young trees.

When a branch, more especially a large one, has to be removed it should be done in such a way as will ensure the quick healing over of the wound, which in the meantime must be shielded from the attacks of fungoid and other diseases. The thing especially to avoid when amputating large branches—or, indeed, small ones—is the leaving of stumps several inches long. It has been argued that it is wise to

leave such stumps for a time, because in the event of decay setting in it may do so without injury to the main stem, and because they also prevent the loss of sap. Such arguments are utterly erroneous. The stump will inevitably die and prevent the healing over of the wound. Figs. 323, 324, and 325 show exactly what happens. In cutting off a branch the invariable rule should be that the cut be made in a line with the outside of the stem or branch from which it springs. The lines in fig. 326 show the right and the wrong way. If the direction of the cut is from A to B the stump of wood (BC) is out of the direct flow of sap, and although the wound may in time become healed over, it is much longer in doing so, and the danger of decay setting in is proportionately greater. The line AC is the proper direction the cut should take, irrespective of the size of the wound.

For the same reasons the partial pruning back of lateral branches, which has been re-

saw it off roughly (cutting the under side first) a foot or more from the trunk before the final cut is made. Otherwise the branch, through its own weight, is apt to split when half-sawn through, and possibly tear a great wound in the trunk. Fig. 328 shows how a small branch should be removed.

However carefully the amputation of a large branch is performed, it will be some years



Fig. 323.—Imperfect Pruning. Condition of the stump at end of fifth year.



Fig. 324.—Condition of the stump at end of tenth year.



Fig. 325.—Trunk of an Oak ruined by the decay of the Stump of a Branch.

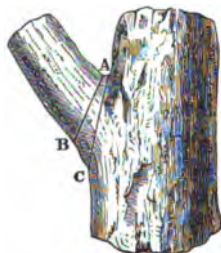


Fig. 326.—Right Method of Pruning. Cut should be made in the direction of A to C, not A to B.



Fig. 327.—Removal of a large Limb. Side and front views.

before the wound is quite healed over, i.e. covered with a new layer of wood and bark. During that time it is exposed to various dangers. The action of sun-heat may crack the surface of the wound and allow moisture to enter; the spores of fungoid parasites may obtain a footing, or injurious insects may deposit their eggs there. Certain trees, like

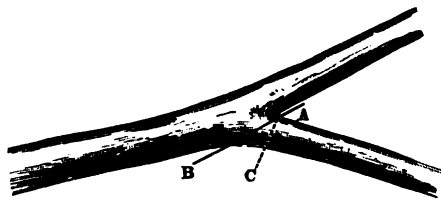


Fig. 328.—Removal of Branch at a Fork. The cut should be from A to B, not A to C.

Oak or Elm, are, on account of their hard wood, less liable to injury than others like Lime or Horse Chestnut, but for all trees the best dressing for wounds as a protection against these evils is coal-tar. This is a by-product in the manufacture of gas, and being liquid it can be smeared over the wound with a brush, and all danger from fungi, insects, &c., is avoided. On very large wounds that take years to heal over, the drying effects of the sun may make it necessary to renew the coating once or twice. When applied, the coal-tar should be as liquid as possible. In winter it is often too stiff to use without heating slightly. Whilst it is useful to apply to the wounds of

commended as a means of stimulating the growth of the leading shoot, should always be done at a fork, and the cut should be made in a slanting direction, nearly or quite in a line with the branch that is left (see fig. 327). In removing a large branch it is always best to

all trees, whether large or small, the powerful acid it contains renders it unsafe to smear over young bark. It should not, therefore, be applied so abundantly or carelessly to wounds that it runs down on to the healthy surface of other branches.

The pruning of dry-wooded trees like Oak, Elm, Ash, Beech, &c., may be safely done at any season of the year that is most convenient, but the removal of large limbs is, on the whole, better done in autumn or early winter. This allows the surface of the wound to harden and the tar to get thoroughly set before the strong flow of sap begins again in spring. This rule should be particularly adhered to in the case of the resin-bearing conifers, which have been known to bleed to death through pruning in spring. Fig. 329 shows a large wound partly healed under proper treatment.



Fig. 329.—A Healing Wound.

Pruning of Old or Sickly Trees.—One of the advantages to be derived from pruning, to which allusion was made at the commencement of this chapter, was that of improving the health and renewing the vitality of old trees. A very common object in gardens and parks is an old tree, valued perhaps for its age, its history, or its rarity, with its trunk and branches decayed here and there into cavities or studded with dead snags, and even its healthiest branches straggling, gaunt, and ill-furnished with foliage. It is such trees that pruning will often invigorate and improve. The first step in their treatment would be to prune off all the snags close to the trunk, in accordance with the methods already described. The next would be to clean out the cavities of all decayed wood and accumulated filth, to give the surface of the wood inside a liberal coating of tar, and then to plug them up with neatly fitting pieces of oak or other lasting wood, the ends of which must be left even with the trunk and tarred over. If the tree is not too decrepit, new wood will gradually close over this "stopping" as if it were an ordinary wound (see fig. 329). The living, more or less healthy head of the tree now remains to be dealt with.



Fig. 330.—Old Oak pruned.



Fig. 331.—Old Oak restored.

The chief cause of poor health in old trees is insufficient nourishment. This may arise partly from the decay which has been allowed to set in upon the trunk and branches, but it is more often directly due to impaired root-action. The balance between the leaf-bearing surface and

the roots has by some means been destroyed. Pruning can in a great measure restore this. By a careful shortening back of the branches and a general reduction of the head of the tree (it may be by as much as one-half and still allow the natural outline of the tree to be

retained) the parts that remain are better nourished, a healthier leaf-action is induced, and this, reacting on the roots, brings about a permanent improvement in the vigour and health of the tree. See figs. 330, 331, of an old Oak that has been treated in this way. It may be mentioned that this result is accelerated by top-dressing the roots with good soil or even short manure. An occasional thorough watering, too, is a great help in seasons of prolonged drought.

Pruning of Shrubs.—The pruning of evergreen shrubs merely for the purpose of keeping them to some given size or shape is a simple matter. The true problems of pruning scarcely arise. All that is required, as a rule, is the maintenance of some particular outline, such as in topiary work, hedges, low banks of Laurel, &c., or the restricting of individual shrubs to certain dimensions. The best, and generally the most convenient, time for this kind of pruning is in July and August. With flowering evergreens, like *Berberis stenophylla*, *B. Darwinii*, *Rhododendrons*, and such like, the case is different. The succeeding crop of blossom has to be considered. With these the best time to prune is as soon as the flowers are over. It is desirable to get as long a season of growth as possible. For this reason, especially with evergreens that flower rather late, it may sometimes be worth while to sacrifice a year's flowers and prune as soon as growth commences in spring. As a general rule, however, such plants do not need pruning. It is only when they are outgrowing their bounds, or getting out of shape, or perhaps not in good health, that pruning is required. Large *Rhododendrons* that have been damaged by transplanting, or have become thin and poor in leafage, are often benefited by reducing the growths. They may, indeed, be placed in the same category, and treated on the same principles, as the old trees whose reinvigoration has already been discussed.

Irish Yews, the fastigate *Cephalotaxus*, and other erect-growing shrubs or small trees, often consist of a mass of erect, comparatively thin and weakly, growths huddled together, and are very apt to blow loose and become unsightly during our winter storms. This necessitates a good deal of labour in tying, which may, however, be largely avoided by forming a central stem to each plant and keeping the lateral branches shortened back, adopting, in fact, the same methods that have been described in regard to large-growing trees. Hollies, Pines, Spruces, Firs, and the like should always be

kept to a single stem if the object be to obtain fine specimens.

Deciduous shrubs that are grown for their flowers may, for purposes of pruning, be divided into two groups, viz: (1) those that flower on wood made the previous year (which constitute the great majority); and (2) those that flower on wood produced during the current season, such, for instance, as *Spiræa japonica*, *Genista tinctoria*, and *Hydrangea paniculata*. It is a general rule with all shrubs that as long a period as possible should intervene between the time of pruning and the following flowering season. Taking first the second group, i.e. those that flower on the current season's growth—as a rule from July till the end of autumn—pruning has to be done in winter, or not later in spring than when the first signs of growth are visible. The autumn-flowering *Spiræas* (*S. japonica*, &c.) and *Hydrangea paniculata* may be taken as examples. These remain in flower up to late autumn, and, if undisturbed, the old flower stems will remain on the plant all the winter. The pruning of these shrubs consists in shortening back the growths that flowered the previous autumn; also, if there is a likelihood of the new growths being too crowded, in entirely removing some of the old stems. If the plants are tall enough for their position they may be spurred back to within a few buds of the older wood. On the other hand, small plants need little more than the tips of the growths removed. There are a few other shrubs, like *Forsythias*, *Chimonanthus fragrans*, *Prunus triloba*, &c., which, although they flower on the wood of the previous year, do so early in the year before the growing season commences. These also should be pruned on the shortening-back system, because if pruning is done as soon as ever the flowers are over, the whole, or practically the whole, season of leaf-growth is still available for them. Fig. 332 represents a *Forsythia* in winter unpruned, with lines indicating what should be cut away in April, after the flowers are over. Those shrubs which belong to group 1, such as *Philadelphus*, *Diervilla*, *Deutzia*, the earlier flowering group of *Spiræas*, and the like, flower after the growing season has well begun. To cut back the shoots of these in winter or spring would be to remove the flowering wood. If, on the other hand, they are spurred back after flowering, the season of growth is curtailed and the succeeding crop of flowers greatly reduced. It is evident, therefore, that to merely shorten back the shoots would be wrong. Pruning for shrubs of this group must be mainly a matter

of thinning out—that is, of removing the wood that has flowered and become comparatively useless, also thin rubbishy growths, and by this means giving the young maiden wood more light and air. The results of this treatment are seen in longer, stouter, better-ripened growths, followed in due season by a more abundant

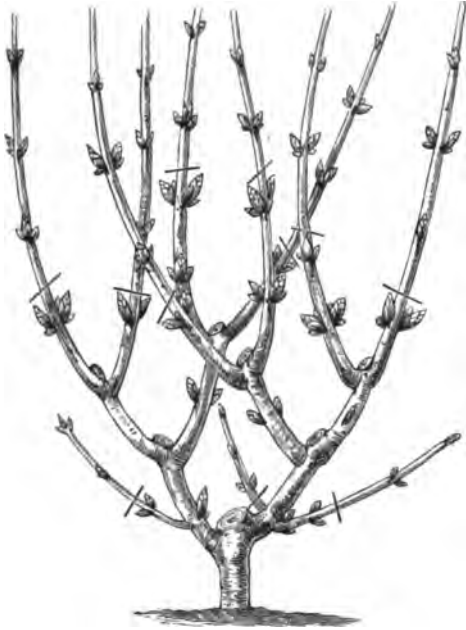


Fig. 332.—Forsythia, showing method of pruning in Spring after Flowers.

crop of blossom. The flowers are not only more plentiful, but often larger and more finely coloured. The indiscriminate clipping back of shrubs of this class is a common evil in public parks, and in places where such work is delegated to the garden labourer armed with a pair of shears. Such mutilation destroys the health as well as the beauty of many shrubs. No person should be allowed, unguided, to prune any plant in ignorance of its time of flowering and mode of growth.

There is one branch of pruning which, although a matter of routine in the management of greenhouse plants, is generally neglected in the case of hardy shrubs. This is the development of a dwarf stocky habit induced by an occasional pinching out of the growths when the plants are young. It is not, indeed, necessary for the great bulk of hardy shrubs—which, if given sufficient space, naturally develop a rounded bushy habit. Still, there are some shrubs which acquire a gaunt, “laggy” habit if left to themselves. The commonest examples occur in the leguminiferous family. Many of the Brooms, like common *Cytisus scoparius* and

its variety *Andreanus*, *C. alba*, *C. præcox*, *Spartium junceum*, &c., are apt to form a thick, heavy top, with nothing but a few bare stems below. Although, of course, perfectly natural, this habit often renders them unsuited for well-kept borders. It can, however, be overcome by continually “topping” the young plants from the time they are a few inches high till large enough to plant out. Cultivators of shrubs will recall other similar instances. They occur even among garden Rhododendrons—as a rule the most bushy of hardy shrubs. The variety *Sappho*, perhaps the most beautiful of the blotched varieties, assumes a thin, straggling habit if the growing shoots are not stopped every summer whilst the plants are small.

The methods of pruning for fruit-trees and bushes, Vines, Roses, &c., are dealt with in the chapters devoted specially to them.

Root-pruning.—This form of pruning is employed by cultivators of hardy fruit-trees to counteract a too luxuriant woody growth, which has, as its usual concomitant, a deficient supply of flowers and, in consequence, of fruit. This condition is sometimes brought about by too generous conditions at the root, but more often is due to the hard pruning of the branches. Such hard pruning is a necessity under many of the modes of culture practised in gardens at the present day. Fruit-trees on walls, cordons, espaliers, dwarf Apples and Pears, are all instances where the necessarily restricted limits to which the trees are confined induce a succulent, leafy, often unfertile growth. The remedy in all these cases is to check the disproportionate activity of the roots. This can be accomplished by transplanting, or, where the trees are too large for that, by shortening back the roots during the resting season, preferably about the time the leaves are falling. A trench (circular in the case of standards, semicircular for wall-trees) must be dug at a suitable distance from the stem, and as deep as any roots go. All the roots as they are found should be cleanly pruned off with a knife. When the lateral roots have all been severed, it is necessary then to undermine the mass of soil and cut off any tap-roots that may have entered the sub-soil. This undermining requires some care when the mass of soil is 6 feet or more across. A portion only should be done at a time, and after the roots have been cut this should be firmly packed with soil before a further portion is proceeded with. In the case of very large trees the operation may be spread over two or three seasons. The effects of root-pruning are visible

the following season—the growths are shorter and less succulent, and the fruit-buds more numerous. It generally happens that when once a fruitful condition has been brought about, it continues. The production of fruit is itself the best countercheck to rampant growth.

Whilst root-pruning is mostly adopted in the fruit-garden, it may sometimes be profitably used also in large greenhouses or conservatories where flowering plants are planted out in borders. The same causes that bring about a too robust growth and deficient fruitfulness in kitchen-garden trees may bring about a shy-flowering condition in some greenhouse plants. *Clethra arborea*, for instance, planted out in a rich conservatory border, will often fail to flower anything like so well as when restricted in pots or tubs. The remedy in this case also is a judicious root-pruning.

After what has been said, it need scarcely be pointed out that root-pruning cannot be employed to cure the barrenness of trees, which is due to lack of vigour or starvation at the root.

Ringling.—This term has been given to a process which consists in removing a narrow ring of bark from a branch or stem of a tree. The theory of the operation is that whilst it admits of the flow of crude sap from the roots to the leaves, it prevents the downward flow of the elaborated sap, and thus the growth above the “ring”, and any fruits it may bear, are likely to be better nourished, larger, and more highly-coloured than would otherwise be the case. In practice the operation is often harmful, and is rarely resorted to in good English gardens. In American gardens, however, it is practised by some fruit farmers. “Ringling is useful in two ways—it may set unproductive trees into bearing, and it may modify the fruit which is borne above the ring. The philosophy of the one is that the extra food tends to develop fruit-buds; the philosophy of the other is that the extra food hastens the maturity and increases the size of the fruit already growing. It is generally a last resort. If a tree here and there persists in being barren, ring it as an experiment. If the whole plantation is fruitless, and has yet received all the care which legitimately makes for fruitfulness, then ring all the trees. There are, however, more fundamental and general means of promoting fruitfulness” (Bailey).

[W. J. B.]

CHAPTER XXII.

FLOWER-GARDENS AND PLEASURE-GROUNDS.

FORMATION OF A GARDEN—RESERVE GARDEN—SUB-TROPICAL GARDEN—HARDY PERENNIAL GARDEN—THE ROCK-GARDEN—A ROOTERY—DECORATIONS—FORMATION OF PLEASURE-GROUNDS—APPROACH ROAD—WALKS—SHRUBBERIES—THE ROSE-GARDEN—AMERICAN GARDEN—DECORATIONS—LAWNS—BOWLING-GREENS—LAWN-TENNIS GROUNDS—ORNAMENTAL WATER.

I. FORMATION OF A FLOWER-GARDEN.

General Remarks.—In the more strict acceptance of the term, a flower-garden forms part of the grounds surrounding the dwelling, or some spot adjacent to it, that is set apart for the special cultivation of flowers. It should be placed, if not quite adjacent to the house, within a short distance of it, and where it is visible from the principal windows; and in that case it ought to be made as ornate as possible, having due regard to the canons of congruity and good taste. Statuary may be sparingly introduced, also a sun-dial, a fountain, arbours of various kinds, either constructed of rustic woodwork or of ironwork, covered with creeping and climbing plants, such as Roses (climbing and on their own roots), Clematis, Menispermum, Ivy, Ampelopsis, Aristolochia, Honeysuckle, or similar plants.

As a rule artificially coloured materials should not be used for covering the walks, although small pebbles of various colours may be admissible when arranged in patterns, and embedded in cement in a tasteful manner to form a firm dry surface around seats, or as floors for summer-houses. Flower-beds are most effective when set in grass.

Shrubs of small growth and trees of low stature may be employed at set distances apart within flower-gardens of regular design at rare intervals, and near the margins and at salient points of the design. In some cases even, they may form the central objects in beds of large size, in which positions such species should be chosen as will not be injured by the necessary close clipping or knife pruning, or which are naturally of a close compact habit. As specimens of the former, *Desfontainea spinosa*, *Buxus balearica*, many of the smaller leaved Hollies, both green and variegated, *Euonymus radicans* and *E. japonicus*, *Phillyrea angustifolia*, may be named; and of the latter, *Juniperus communis*, *Cupressus Lawsoniana* in variety; Irish Yews, golden varieties of the common Yew, *Libocedrus*

decurrens, *Thuja occidentalis*, *Retinospora squarrosa*, and other Conifers of columnar habit of growth. The use of formal clipped specimens of evergreen shrubs is admissible; but it may be pointed out that these should either form a leading characteristic of the garden, or else be very sparingly employed. It is well for the planter to bear in mind, in selecting the more permanent plants of a garden, that these must perforce remain in all probability for many years, whilst the evanescent varieties of flowers, and even the shapes of the beds which they are used to fill, may be changed at comparatively short intervals of time, according to the fancy or taste of the owner or his gardener.

Shrubs of larger growth than those usually found suitable in the flower-garden itself may be used, as it were to enshrine it; also to afford wind-breaks, as sheltering for promenades, and as foils and contrasts to the flowering plants. Usually evergreen plants have been solely employed for this purpose, the more beautiful flowering deciduous shrubs being excluded. A better plan is to employ both, one or the other predominating as taste may dictate.

Although, as regards this country, the flower-garden may be said to have come into existence towards the end of the first half of the present century, it has during that time gone through several phases; the more simple arrangements and combinations of the earlier examples being followed by the period of hard straight lines, intricate geometrical figures, and strong contrasts of masses of glaring colours; these in turn being succeeded by a more refined and natural arrangement consequent upon the employment of plants possessing noble form and graceful foliage, and the combination of these with others of more subdued colouring than were in vogue in bygone years.

Position.—Before proceeding further it may be well to note a few of the mistakes as to position, construction, and the use of plants, that have done much to bring discredit upon this style of gardening. In the first place, a flower-garden, in common with anything else, may be a beautiful object in itself, and still be so far out of character with the situation in which it has been placed as to injure the effect derived from something of far greater importance. This is a mistake we see exemplified in old gardens, as well as in some new ones, where the flower-garden has been placed in a very prominent position, adjacent to the mansion, and occupying the foreground of perhaps an extensive view. In such a position it frequently forms a

blot in the picture offensive to the eye of those persons who are gifted with taste and judgment in regard to landscape effect; but if, instead of being placed in such a prominent position, a situation had been chosen where the view was not thus objectionably interfered with, by the introduction of colour betwixt the eye and distant objects, this fault would have been avoided. The introduction of a mass of colour, although it be small in amount, in front of a mansion, where the windows command views over a broad open landscape or park scene of moderate extent, is a glaring mistake. This objection does not carry so much weight if the flower-beds are placed so that the eye is carried over them; or where the beds are hidden wholly, or partially, by a terrace; or are placed, as is sometimes necessary, on rapidly falling ground. There are, indeed, few places in which the desire for a flower-garden cannot be gratified without placing it in a spot where this objection will apply; for there generally exists, or may easily be found, a suitable site, more or less confined by shrubs and trees without being overshadowed, in which a flower-garden may be constructed without interfering with anything else, and where it can be fully enjoyed. In places of small extent, where even from the best point of view there may exist something in the distance that is objectionable, and from which it is desirable to divert the eye, then the introduction of a flower-garden, instead of being out of place, will be one of the best possible means of effecting the desired end.

Extent.—This is a very important consideration, not only as affecting the flower-garden itself, but every other department in the establishment. In many places the extent to which the bedding-out of masses of tender exotics is even now indulged in becomes inimical to good gardening in every other department, by reason of the labour and resources of the place at the disposal of the gardener being inadequate to cope with the yearly propagation and continuous attention required by the immense number of plants employed. This evil has been much increased by the introduction of spring bedding, which has become indispensable where the full measure of floral effect is to be produced during two-thirds of the year, and is especially enjoyable in the early spring months, before the summer bedders have been planted out. In fact, the spring occupants of the beds are by many persons looked upon with even more favour than those which follow them. The labour attending flower-gardening is also much increased by the

now somewhat discredited fashion of carpet-bedding. It therefore behoves anyone who contemplates the formation of a flower-garden to consider fully the available labour and means for the propagation of and housing of the plants required; for a small garden well managed is immensely preferable to a much larger one indifferently kept up.

The site chosen, it becomes a consideration how to dispose of the available space. Nothing is more common than to see a piece of ground, square or otherwise, inclosed by a wall, a hedge, or a formal bank of shrubs, in which far the greater portion of the surface is occupied by flower-beds, having the effect of a large highly-coloured picture in a scanty frame. Now, had the central portion been lawn, with flower-beds here and there skirting the paths, and the border filled partly with shrubs and partly with herbaceous plants, the effect would have been better and less costly.

The beds for flowers should be simple in design, a circle, oval, or oblong being preferable to star or crescent or zigzag shapes. In the arrangement of paths, too, the plan should be simple and natural both in curve and direction. Serpentine wriggles are ugly, whether in path or flower-bed. Raised or sunk beds are equally objectionable. Where gravel is used in a parterre to separate the beds an edging of some sort becomes a necessity, in order to keep the soil in position; for this purpose box-edging looks much the best, and is the most appropriate; but a flower-garden cut out of turf looks incomparably better than any arrangement that requires a permanent edging to the beds.

Aspect.—A southern or a western aspect is in some measure the best, but east or even north will do if other essential conditions exist, such as a sufficiency of light from the absence of high walls or trees in the near neighbourhood of the garden. It is of little use attempting flower-gardening in exposed situations, where nothing exists, or can be induced to grow, to check the force of the wind, especially since subtropical plants have become so generally employed, and which are considered to be more or less indispensable to break the otherwise monotonous and too even surface of beds of flowering plants. These usually tall-growing foliage plants require considerable shelter, or their leaves become so disfigured as to render them unsightly, instead of being objects of beauty. It is seldom, however, that the land slopes so much that shelter belts of tall-growing evergreen and deciduous shrubs, with a few dwarf-growing trees, *Thuias*,

Cupressus, and others which will be treated of in their proper place, cannot be planted to afford shelter from the wind. It is wonderful how well the lowly vegetation of which a flower-garden mainly consists succeeds with the shelter afforded by shrubs of only 7 or 8 feet in height, provided it be sufficiently dense.

Preparation of the Ground, Drainage, &c.—The measure of success to be attained in flower-gardening depends a good deal upon the nature of the land. Heavy retentive soils, even with the assistance of thorough drainage, do not answer, for several reasons. The nature of flower-garden plants is such as to require a soil that is warm and tends to early development, so that they may, after planting-out, grow away rapidly, and in the least possible time fill their allotted space. Where this does not take place their season of beauty is shortened, and the autumn frosts are upon them by the time they assume their best garb. Again, the majority of the plants employed are fine-rooted, and make greater progress in a soil that is readily pulverized, and which offers little resistance to the penetration of the young roots. In heavy ground these conditions are altogether wanting, consequently the natural soil must be removed from the beds, and replaced with a properly prepared light soil. In the case of soils of medium quality, amelioration may be effected by the addition of charred garden refuse, an admirable substance for fine-rooted plants; sand, leaf-mould, and lime; and with an infertile soil the addition of rotten manure may be desirable. It would be better still were the whole surface of the garden so treated—both the space occupied by the beds and that which is between them, for this reason, that if at any time the design had to be altered, and the beds occupy different positions, no further addition would be required.

The only objection to this is the excessive exuberance of the lawn grasses and the consequent frequent necessity for mowing. This, in part, does away with a serious difficulty. In draining heavy land for such purposes, where the natural retentive soil is wholly or in part replaced by such as is lighter and more porous in the space occupied by the beds alone, each individual bed acts as a receptacle for the water that naturally drains to it from the surrounding less absorbent ground, involving the laying of a drain or drains under each bed to carry off the otherwise stagnant water. To assist in doing this, if the land is of a wet and retentive nature, a layer of brick rubbish or similar material should be put in the bottom of each

bed to the depth of 1 foot, and in the case of subtropical beds a mass 2 feet in thickness is not too much.

For subtropical plants it is not only necessary that the land should be thoroughly drained, but the bottom of the beds should be so constructed as to form a continuous drain by which the water may be carried away as through a sieve, the sun's warmth following the course of the water through the soil. This ought to be from $1\frac{1}{2}$ to 2 feet in thickness, and of a light and porous nature, consisting largely of decomposed vegetable matter, such as peat, leaf-mould, spent hops, and fibrous turfy loam, combined with sand in sufficient quantity to keep the whole sweet and porous.

For bedding plants in general the soil should be not less than 15 inches in depth, with, for most subjects, except strong-growing ones such as Zonal Pelargoniums, a layer, 2 inches in thickness, of manure at the bottom to afford nutriment to the plants during dry weather. When the natural soil requires an addition of some that is lighter, if peat happens to be plentiful in the neighbourhood it may with advantage be used; for most plants that do not absolutely require such soil, do well in a mixture consisting of it and loam. Peat also has the property of retaining moisture for a longer period in dry weather than loam alone, and is so far useful in very dry seasons. Thoroughly decomposed leaf-mould, that will shrink but little afterwards, is a good material for lightening heavy land, and for the purpose under consideration it may be used in considerable quantities. If, on the other hand, the soil is too light and poor, it should have enough of a stronger and better description added to it, such as clay or heavy loam or lime.

Water.—There is one great requirement too often wanting in many gardens, namely, an adequate supply of water, stored at such a height as to be available everywhere without having recourse to hand-pumping. There is, indeed, less provision made in this matter in the south of the kingdom than in the north, where from the greater rainfall it is less required. In no department is this lack of water more felt than in the flower-garden, where, from the surface-rooting nature and quick growth of many of the plants, it is much required, and where to apply it in dribbles—as must necessarily be the case when it has to be carried by hand or conveyed in the ordinary water-barrow—is even worse than not at all. Every flower-garden of any pretensions should be furnished,

according to its dimensions, with a certain number of hydrants and stand-pipes connected, by means of underground iron or lead pipes, with a sufficient head of water to furnish an ample supply in the driest weather. These stand-pipes should be so arranged that portable hose-piping can be attached, as to enable the gardener to thoroughly moisten the beds when they require it. There are few gardens where water could not be made available by means of an hydraulic ram, water-wheel, or small engine driven by steam, gas, or horse-power, pumping it to a point sufficiently high to give a head that would do away with the greater part of the ordinary manual labour, and its accompanying extravagance and inefficiency. In hundreds of places where the garden has now a deficient water-supply, there are streams at hand, down which millions of gallons run yearly to waste, which at comparatively small outlay for pipes to convey it from a point higher than the garden, might, without any expenditure in mechanical appliances, be made available.

Where there exists a stream below the garden level, sufficiently large that it may be depended upon for a supply in dry seasons, a pump driven by a water-wheel, or a ram, would afford an inexpensive means of providing the quantity required, but in that case it would be necessary that the supply should be plentiful, as the quantity required to drive the wheel or ram, which escapes, is considerable. Where the available supply of water is limited, the ram affords the more efficient means of raising it to a higher level, the waste of water being less than is the case with a pump driven by an undershot or overshot wheel. There are likewise pumps driven by wind, which in some places might be found of use, only, the power being intermittent, involve the erection of larger storage tanks than are called for by the ram or water-wheel. With a small but continuous stream, a ram will, by its incessant action, throw a large body of water to a considerable elevation. A small engine, say of two or three horse-power, worked one day or so each week, will lift an immense volume of water. If any of these appliances are adopted it will be necessary to provide sufficient storage in the shape of large tanks or reservoirs; but where there exists a supply of water at such an elevation that it can be conveyed through a simple pipe by its own gravity to the point required, the cost is usually small.

Style.—The site being selected, and the preliminary preparation of the ground in the shape of drainage, levelling, position of the walks, &c.,

completed, the next matter to be considered is the style to be adopted in the laying out of the garden. In this there is considerable latitude, especially in the case of a new garden; the principal guiding points being the position and surroundings, such as the style and size of the mansion — especially the latter. A garden so small as to be out of proportion to a large stately building to which it may stand in close proximity, would be quite out of character, yet not so much so as when, in the other extreme, more commonly met with, it covers a large surface out of proportion to the small size of the residence. In this there is, of course, no fixed

rule by which to be guided; but the garden should be proportionate in size to the building of which it is an embellishment, always bearing in mind that it is better to err on the side of doing too little than to have an unduly large garden. The different styles generally employed in this country may be classed under three heads: the natural, the geometrical, and the symmetrical, the latter more or less free in the manner of its arrangement.

The *natural*, as the term implies, is essentially irregular, and more or less an imitation of nature. It would be futile to attempt to reproduce nature's wildest and most rugged effects

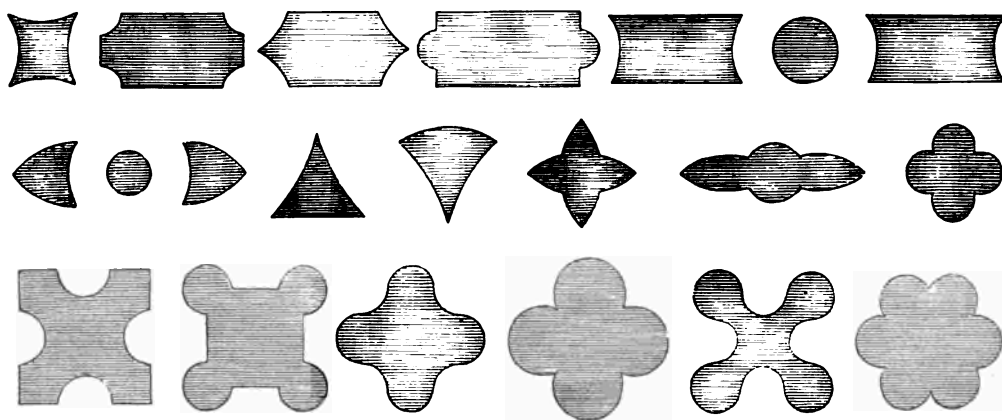


Fig. 333.

in a garden, and imitations of her should be limited to an approximation to what nature in her best mood would do with the material and site available. The disposition of tree and shrub and herb should be with a view to a natural effect, and also with a view to the requirements of the plants, the successful culture of which is the primary object.

The *geometrical* style (by which is also understood the architectural, the ancient, and the formal styles) is that which was very generally employed until a recent date, since it admitted of almost every conceivable form of the parts and of the whole. With a sheet of paper and a pencil, rule, and pair of compasses the arrangement may be varied indefinitely. This style, pure and simple, is essentially formal, and well calculated to afford contrasts or harmonies in colours and a balanced whole, the corresponding beds in the design being alike in shape and size, and filled with plants that match in every way; in fact, supposing such a garden to have a line drawn across the centre, the whole of the beds on one side should find their exact counterpart on the other. It is a style that finds but

little favour with those who make new gardens, and is giving place to a less formal, less costly, and more generally enjoyable form of flower-gardening, in which there is a greater variety of plants employed mostly of a hardy character; and these, although they do not furnish a blaze of colour, produce a longer display, extending from the spring till late in the year. In old places the geometrical garden still survives either in its entirety or as regards the form and disposition of the beds; but there is much greater freedom in the modes of planting, and in nearly every case endeavours are made to get rid of its formality, and to impart variety to it. Fig. 335 is an example of the geometrical style; it is formed by the intersection of five circles, four semicircles, and four quadrants within a square, and thus the shapes of the twenty-nine beds of which the figure is composed, are determined. The most intricate productions of the draughtsman frequently look better on paper than when furnished with plants; whereas simple figures, when well managed in the planting, always have a good effect.

In fig. 333 a number of geometrical forms

are represented, such as are employed singly or in combination with others, and as suggestions it is assumed that they will be found useful to those who desire beds of peculiar pattern. We repeat, however, that for the majority of plants, the simpler the outline of bed the better.

In cases where it is desirable to have flower-

beds on each side of a straight walk, curvilinear beds of the form represented in fig. 334 are sometimes used, being less monotonous than a succession of straight-lined figures, even when these are connected together by circles. Formal subjects, as Cypresses, Irish Yews, trimmed Box, Portugal Laurel, and Laurustinus, or standard Roses, may be planted in the circles



Fig. 334.

between the S-like beds. The device is also well adapted for surrounding parterres laid out in the geometrical style.

The *free symmetrical style*, sometimes called the *mized*, the *irregular*, and the *gardenesque*, as its name implies, is more free and less formal in treatment than the geometrical, and for this reason is preferable for most situations. In this style the form of the beds may be altogether of a more varied description, the outlines differing according to the nature of the surroundings, the requirements of the situation, and the species of plants with which it is to be planted. In this style, also, a flower-garden may to a great extent consist of beds the outlines of which may be so informal as, in a great measure, to conceal the regularity and a certain degree of stiffness that is consequent upon, or more or less inseparable from the planting or arranging of flowering-plants in this way.

Formation of Beds.—A line and measuring-rods will be necessary, and a chain with foot links, or a measuring-tape, will likewise be convenient. For tracing the outlines of small figures wooden compasses will be useful. A large T square, with each bar say 10 feet in length, with the cross-bar movable, so as to be set at any angle, will facilitate many operations. There is little difficulty in laying down any individual figure on the ground, if the plan be truly drawn to scale; but where a design consists of a number of figures, each of which must not only be correct in itself, but likewise occupy its proper position with reference to the others, accurate measurements and method are required.

Fig. 335 will appear complicated to some persons, but it may, nevertheless, be laid down correctly on the ground without the necessity

of constructing many squares. Mark the corners of the square to be laid out as shown in the figure with pegs; find the centre of each side, and on each side of these centres lay off half the intended breadth of the walks, driving in pegs at that distance. Every two adjoining pegs will thus be at a distance from each other equal to the breadth of the walk. Stretch

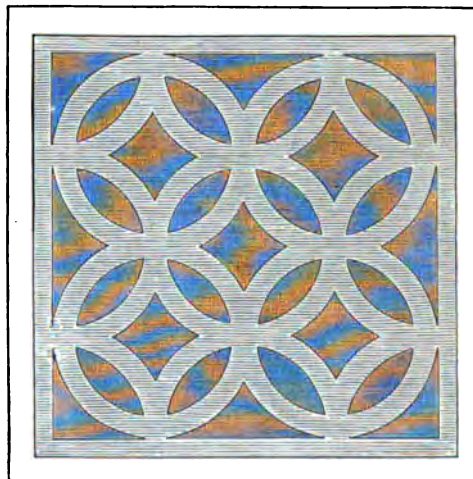


Fig. 335.—Geometrical Flower-garden.

a line from each peg to the one immediately opposite to it on the other side of the ground, which will thus be divided into four squares, each obtruding upon its neighbouring squares by a distance equal to half the breadth of the walk, and four smaller squares within these which do not intrude upon each other. Find the centres of the larger squares by drawing lines from corner to corner; drive in pegs to mark these centres, and one in the centre of the square of ground, which will likewise be found

by this process; also other pegs where the diagonals intersect each other near the centre of each side of the ground. The distance of these pegs from such centres will be equal to half the breadth of the walk. There are now nine pegs inserted within the square, each of which will

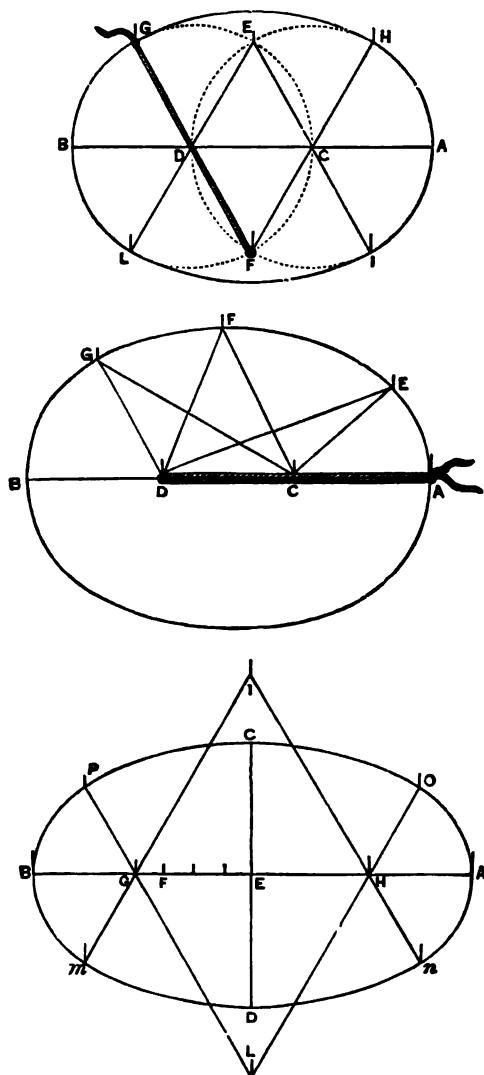


Fig. 336.—Ovals of various diameters and methods of striking them.

serve as the centre of a circle. With a radius touching the sides of the larger squares, describe a circle round each centre, and with a radius touching the internal sides of the smaller squares—or, in other words, a radius equal to that formerly employed, less the breadth of the walk—describe circles within those already formed. Lastly, with the pegs at the corners of the piece of ground as centres, and with radii touching the points where the adjoining curves

intersect the sides of the square, describe two quadrants in each corner.

In many cases it will be found most convenient and sure to fix certain important points by triangulation, employing one or more lines already fixed as bases. The position of any point opposite one of them may be thus found on the ground:—Lines from the point to each end of the base-line will form a triangle; take two measures equal in length to the respective sides of the triangle, extend them from the ends of the base-line, and where they meet when stretched is the position of the point. Figs. 336 show how to strike an oval bed by means of pegs and a line, the method being indicated by the lines in the figure.

By the modes here explained, or by others that it may be found convenient to adopt according to circumstances, any one may easily lay out a flower-garden, even although the plan should be of the most intricate description.

Planting.—This is a matter which must be left to individual taste. There may be masses of colour with or without marginal lines of a different colour to mark the edges; where possible, each bed should contain one colour only; or the beds may consist of plants of say two or three different colours, such as blue and white, orange and brown, yellow and white, &c. Violent contrasts are not nearly so pleasing as the gradual blending of colours, giving the preponderance to those which are of a subdued tone. Then, again, the highest colours should occupy the beds at the boundary of the garden, inasmuch as these, wherever they are, will most attract the eye, which is instinctively drawn to them, and thus, if occupying the central portion of the design, they would have the effect of apparently diminishing the size of the garden. As to the height of the plants which form the principal furnishing of the garden, they should seldom be so high as to obstruct the view of those in the adjoining beds, if it be a garden to be taken in at a glance.

Whatever arrangement is adopted for the summer season, it can only be satisfactory for that period, leaving the garden without interest for the greater portion of the year, unless recourse is had to the employment of winter and spring bedders, which afford a desirable degree of continuity to the display, the free use of which cannot be too much encouraged. But here again discrimination is required in the selection of plants in every way suitable for the purpose. In addition to Dutch bulbs, such as Hyacinths, Tulips, spring Crocuses, *Scilla sibirica*, and *S.*

s. alba, *Chionodoxa Lucilla*, and *C. sardensis*; Narcissi, Snowdrops, Violas of different colours, double-flowered red and white Daisies, early Wallflowers, *Arabis albida*, Aubrietias, *Silene pendula*, Myosotis in variety, *Ajuga reptans*, valuable for its deep-red foliage; Polyanthus in variety, Primulas, Alpine Auriculas, and numbers of other early-flowering herbaceous plants, can be brought from the reserve garden in the autumn as soon as the summer occupants have lost their beauty, and occupy their places until the time again comes round for planting the summer bedders. Several culinary vegetables have been pressed into this service, in the shape of Beet-root with coloured leaves for the summer, and Kales variously coloured for the winter; but with the abundance of flowering plants that we possess, these vegetables, devoid as they are of every association connected with the idea of a flowering plant, are better left in the kitchen-garden.

Reserve Garden.—In every establishment where the highest kind of flower-gardening is carried out, the reserve garden, where these winter and spring bedding-plants can be cultivated, is a requirement that cannot well be dispensed with. It should be in a somewhat sheltered spot, but one which is not so confined by trees or buildings as to make the plants in any way drawn or delicate. The soil should not be too rich, or it will have a similar effect; it should also be light in texture, so that the plants may be taken up with their roots entire, and with good balls, for this alone enables them to quickly become established.

Subtropical Garden.—As to subtropical plants, these, as already intimated, must be placed where they will be well sheltered from the winds, otherwise it is of little use to attempt their cultivation. If the immediate neighbourhood of the flower-garden proper affords this necessary shelter, it will be an advantage to have them near it, for the association with flowering plants, of Palms, Aralias, Wigandias, Tobaccos, Blue-gum, Ficus, Cannas, &c.; the quaint forms of the Agaves, Yuccas, Dasy-lirions, Musas, and Dracenas; and the graceful elegance of Arundos, Zeas, Bamboos, Gyn-eriums, and a host of similar plants, will afford a most desirable contrast to any stiffness existing in the flower-garden. Where the nature of the situation is such as to be suited to the requirements of these plants, and they can be introduced round the margins of the space occupied by the flower-garden, these fine-leaved subjects act as a sort of setting to the

others, and very fine effects can thus be produced. In the use of subtropical plants, however, in whatever part of the country they are employed, nothing should be introduced that will not thrive and present a healthy appearance, for the mere rarity of a plant, however uncommon it may be, is but poor compensation for an unsatisfactory condition of growth. No plant should ever be tolerated in a garden that is so far unsuited to the soil, situation, and climate as to present an unhealthy appearance, nor is it necessary to resort to such whilst we possess such a wealth of fine plants from which selections can be made that will succeed in almost any situation that is suitable for a garden.

Hardy Perennial Garden.¹—There is one effect which the earlier methods of massing flowers was instrumental in bringing about, and which is very much to be regretted, namely, that in many gardens it has almost driven out of cultivation the grand old herbaceous plants which used to be cultivated, and amongst which may be numbered hundreds of the most beautiful and interesting garden plants—plants which furnish a continuous succession of diverse flowers and foliage from almost the dawn of the year to its close. Amongst them may be named the whole family of hardy bulbs, including the Scillas, Erythroniums, Colchicums, Narcissi, Irises, Fritillarias, Tigridias, Lilies, &c.; and the still more numerous families of fibrous-rooted and tuberous-rooted perennials, such as Delphiniums, Lathyrus, Iberis, Hepaticas, Hellebores, Gnaphaliums, Geums, Gentianas, Gaillardias, Francoas, Epimediums, Dodecatheons, Dielytras, Dianthus, Chelones, Cheiranthi, Rockets, Aconites, Alysums, Anemones, Antirrhinums, Aquilegias, Campanulas, Aubrietias, Lychnises, Lythrums, Mimulus, Veronicas, Kniphofias, Funkias, Spiræas, Silenes, Saxifrages, Ranunculuses, Primulas, Phloxes, and a host of others that by their sterling merits force themselves, as it were, upon the attention, and induce feelings of surprise that plants, possessing such merits as those of being hardy in our climate, and requiring comparatively little attention, could have ever been allowed to lapse into a state of comparative neglect.

The chief objection urged against these plants is, that there are always to be found amongst them some that are in process of ripening off their stems and foliage, and whose well-being will not admit of these being removed whilst any vitality remains in them, so that they give

¹ See also under *Hardy Perennial and Alpine Plants*.

an untidy appearance to the whole. That this objection, to a certain extent, is justified will be admitted, and for this reason their presence in the immediate vicinity of the principal flower-garden, where everything visible should possess the appearance of freshness and vigour, is thought by many good gardeners undesirable. In spite of the reasonableness of this objection, there are now numerous gardens all over the country where herbaceous plants are largely used in the formally laid-out parterres with good effect, in combination with tender plants, annuals, tuberous-rooted Begonias, Cannas, Gladiolus, &c. Such arrangements, whilst not admitting of the vivid effects of massed colours, are exceedingly gay all through the summer and autumn, and are very satisfying by reason of the greater variety of plants employed, as compared with the usual style of planting; and they are maintained at a much less cost. There are, after all, but few establishments where a suitable situation cannot be found for an herbaceous border—not in an out-of-the-way corner, as if the intention had been to hide it; nor in the front of shrubs, often under the disadvantage of being impoverished by the roots and shaded by the overhanging branches of the latter; nor, which is still worse, in the vicinity of deciduous trees, whose branches shade and whose wide-ranging roots permeate every inch of the soil, causing the lingering but certain death of the flowering plants.

The generality of herbaceous plants are light-loving subjects, which, to have a fair chance of succeeding, should never be placed where they will not enjoy a circulation of air, and full exposure to the sun. They enjoy a moderate amount of shelter, i.e. sufficient to break the force of the easterly, northerly, and north-westerly winds; and either trees at a distance, a bank planted with shrubs, or a wall that may happen to exist, will afford them the necessary protection without causing attenuated growth. By far the greater number enjoy a rich deep soil, and if possible annual or biennial transplanting, when the ground should be trenched and well manured. It must be borne in mind that these plants come from widely separated parts of the world, where the climatic and other conditions under which they exist are extremely various, and where some of them may be subject to a considerable amount of frost; and amongst them are many species which will stand our severest winters if they are kept comparatively dry about the crown. To still further assist such as these, a little

hillock of dry ashes or exhausted tanner's bark placed round them is of great use.

With a view also to the well-being of many herbaceous perennial plants during the winter season, the decayed tops, their natural protection, should not in the autumn, for mere appearance' sake, be cut too closely off, especially in the case of such as have continuous hollow stems, for in these the portion left serves as a receptacle for water, which does serious injury to the buds at the base, destined for the future season's growth. In digging amongst these plants the fork is a much more suitable implement than the spade, being less calculated than the latter to injure the surface roots and the labels put down to indicate where the plants are situated. In the herbaceous garden such labels are indispensable, and should be made of good oak-wood or of metal.

*The Rock-garden.*¹—There is a wide difference of opinion with regard to the formation of rock-work in flower-gardens and pleasure-grounds. Some would aim at a representation of mountain scenery, but such should never be attempted unless it can be worked out on a grand scale, as at Chatsworth. It is not necessary to see rocks piled on rocks, as they may be seen in nature, unless it be to show how vain and insignificant are the efforts of man to imitate nature; but from the natural aggregation of rocky materials on a comparatively small scale, useful hints may be derived, particularly from those which are associated with vegetation.

The primary object of a rock-garden should be to afford facilities for the cultivation of a beautiful and interesting class of plants—the alpine—which either would not thrive at all, or could not be seen to the greatest advantage, when planted on level ground. It is also formed so as to hide objects not desirable to be seen from the pleasure-grounds or other points.

Whilst some alpine or rock-loving plants require stations raised above the immediately surrounding parts, others cannot endure much sun, others again succeeding only in the shade.

In the construction of a Rock-garden it is not requisite that the interior portion should consist of good soil, but the whole of the surface, not less than a foot in depth, should be of good quality, and if more, so much the better. If in the locality stone can be had at little cost, a partial admixture of it all through the soil will be productive of good; but where stone is costly, the mound may be constructed up to a certain point of any access-

¹ See also under *Hardy Perennial and Alpine Plants*.



ROCK GARDEN, ROYAL GARDENS, KEW

ible material, the outline of this under or internal portion being made irregular, to correspond with the required inequalities of the outer surface when completed. If there be at hand a choice of stone, a number of large long pieces may with advantage have their ends embedded in the soil of the mound, leaving the smaller pieces for filling in, to be placed in their positions in the outer coating of the soil as it is put on.

In placing the masses, variety of outline and aspect should be studied by making them project, recede, and incline differently. If, however, a sloping ledge in imitation of natural strata is seen in one part, similar ledges in other parts should have a slope in the same direction. All ledges should dip inwards towards the soil. Cavities or pockets should be formed for holding soil, and these ought not to be like square boxes, but somewhat irregularly formed, and frequently with the north side the highest. In placing the stones, the necessary depth of soil to be introduced between them should be allowed for, and also lateral space for the growth of the plants. From not attending to this matter rockeries in other respects well constructed, have lost much of their character in a few years, the smaller projections being completely overgrown.

To attempt to convey an exact idea of the construction of a rockery that will have a natural appearance, neither underdone nor overdone, would be about as futile as to try to impart the knowledge requisite to paint a picture. The best study for the construction of a Rock-garden required for the purpose under consideration, is to note how the stone is stratified in nature, modifying it with a view to affording the best possible conditions for the plants it is intended for. This can be done without giving to the construction that objectionable regular, formal appearance which is so often seen.

At the base of this rock-mound there may be constructed a water-tight basin or canal to be filled with water, proportionate in size with the whole, and of easy outline. This will fulfil the double purpose of providing a supply of water near at hand for such plants as require it in dry weather; and by its position will give a further meaning to the deviations in the course of the walk that should encircle the whole. Where stone and other material for the work is not readily obtainable, roots of trees are sometimes used in part. These should never be employed where the object is to grow alpine plants, as they are out of character, and their decay in the course

of time renders the reconstruction of the work a necessity. Moreover, they harbour rats, rabbits, snails, and wood-lice, all of which creatures are undesirable in any well-kept garden.

So far we have chiefly spoken of rock-work as an accessory to the culture of a particular class of plants that are benefited by the conditions it provides, but as we have already hinted, rock-work of a more pretentious character is often introduced. There is much difference of opinion respecting it. We see attempts made on a large scale to imitate the majestic works of nature, but even where the supply of the right material is illimitable and near at hand, and a lavish expenditure of labour is indulged in, the result is at the best only calculated to display the insignificance of the attempt. The large and costly piles of unmeaning, ill-placed stone, real or imitation, which are often seen, are anything but calculated to excite interest or pleasure in the true lover of nature; yet it by no means follows that because failure is the result of our efforts when we attempt the impossible, we should do nothing in the matter of artificial rock-work. To hide some undesirable object high and more or less abrupt mounds are sometimes raised, and the surface is more or less covered with masses of stone, amongst which shrubs are planted; and in many instances, the result is unsatisfactory, so far as the appearance of the artificial rock goes, the desired object being often better accomplished by other means.

Where there are broad expanses of grass the monotony of which it is desirable to slightly relieve, nothing will do this more effectively than the introduction of large masses of rock partially buried, with one corner standing out higher than the rest, while near at hand, and partially covering the lowest part, may be a plant of *Coloneaster microphylla*, *Vinca*, *Ivy*, or some other plant of similar habit. These isolated masses of rock may, if skilfully placed, be made to look so natural, that their artificial origin may not be suspected. Such masses as the above can frequently be placed at the side of a walk, where, to break an objectionable straight line, it becomes necessary to make a curve, and for doing which it will give an apparent reason. This may be done in places where a tree or shrub would ultimately get so high as to intercept the view from some desirable point.

Where a stream or rivulet runs through the grounds, or can be diverted so as to do so, a great deal of natural beauty may be imparted to the garden by having recourse to work of

this description. Thus, with excellent effect the stream may be made to pass over a rocky bed, merging from a very gradual slope into the most precipitous descent, while the margins may be made to appear as if consisting of ledges of natural rocky strata, giving endless opportunities for the introduction of plants suitable for the partial clothing which is necessary to give meaning to the design.

A Rootery.—As a means of more or less screening from view an unsightly object, the roots of large trees can sometimes be employed with good results. Any refuse material, such as that which may have been dug from the foundations of buildings, and which it may be an advantage to get rid of at little cost of transport, can be used in the formation of the mound, carrying it up with much steeper slope than would be necessary in the case of rock-work. The roots can then be piled up in a grotesque manner over its surface, giving the base a sufficient breadth to afford stability and produce the desired effect, using judgment as the work proceeds, to place the materials to the best advantage, and carrying up the pile to whatever reasonable height may seem desirable. At the base of this mound Ivies in variety, Virginian Creeper, *Vitis Labrusca* and *V. riparia* (*odoratissima*) and other North American Vines, crimson Boursault, Ayrshire and other rampant Roses, *Clematis flammula*, *C. Vitalba*, and numbers of other fast-growing plants that will speedily impart to the whole a well-furnished appearance, may be planted. If the root-stumps are well selected, not using small ones or such as decay quickly, the Rootery will last many years.

Decorations.—Various objects in the shape of vases, fountains, and statues of man and animals, such as deer, hounds, wild boar, horses, lions, &c., are often employed in gardens, the effect being good or bad according to the judgment exercised in selecting such as are appropriate to the surroundings and the sites which they occupy.

Statuary should be employed but sparingly in private gardens, and never occupy too prominent a position. The effect produced by a well-chosen statue placed in a retired nook, and backed up by the dense foliage of evergreen trees and shrubs, is not unfrequently very good; whereas if it had occupied a prominent position, the effect would have been indifferent or altogether in bad taste. The material of which objects of this kind introduced into gardens consist, is also of importance. Stone, or metal painted of a stone-colour, is doubtless the best. Marble

always looks out of place in our climate with its often leaden skies and lack of sunshine. The numerous compositions in imitation of stone are not of an enduring kind, and at best look paltry, so that unless the figure has some pretensions as a work of art, such as these are better dispensed with altogether. If a group of several figures is introduced, it should always be made subordinate, and, as in the case of a single figure, should not be placed in any position where it may convey the idea that it is of greater importance than the garden it is intended to embellish. In any garden, large or small, no single object should find a place which has the effect of reducing the legitimate living occupants to a subordinate position. The architectural style of the building to which the garden is attached is also a matter for consideration when statuary is introduced. Where the architecture is wholly or in part Italian, the moderate use of statuary will not be inappropriate.

The presence of vases, filled as they generally are with living plants, conveys to the mind a different impression to that produced by statuary, inasmuch as the purpose to which they are put imparts to them the character of usefulness, or of subordination to the objects which are cultivated in them. Here again the material employed should be stone, or iron coloured in imitation of stone. The position they occupy is a matter of the first importance. They may frequently be placed with good effect in the immediate vicinity of the dwelling, or at the point where several walks meet; and at the termination of a walk, where there is often an apparent lacking of some prominent object, one large vase or several may be placed with excellent effect. On terrace walls in proximity to a flower-garden of regular pattern vases are often introduced, and serve to relieve the sometime objectionable even surface of the bedded-out plants; but here again the size of the vases should bear some proportion to the size and general equipment of the garden of which they are accessories. We sometimes see vases filled with flowers of the most glaring colours placed on terrace walls that divide the dressed ground from that which partakes of a park-like character, and where such colours even in small amount are most inharmonious. In such positions vases are quite out of place; but on the margins of a walk running parallel to a boundary wall, the latter being covered with Ivy or other plants, they may be very effectively employed, the colours they display being brought out and relieved by the background of foliage, instead of

in the other instance showing against the skyline.

Fountains or basins are sometimes placed in the centre of geometrical flower-gardens, but generally with questionable taste. If introduced in such situations, they should on no account be so large as to be out of proportion with their immediate surroundings, or they will have the effect of reducing the importance of the latter. A fountain and basin may frequently be introduced with better effect at the junction of several walks, and where, in addition, the water will be convenient for use. As a general rule a basin with or without a fountain should be surrounded with a gravelled or paved area, as a stone kerb, however handsome it may be fashioned, looks out of place when it springs direct from a lawn. As a means of preserving a connection of the architectural with the living objects around, means should be found to introduce sparsely foliage and flowering plants at the margin. This may readily be done by constructing a few bays of a size commensurate with that of the basin, with a kerb similar to that. If bays are objected to as adding to the cost of construction, then vases can be employed instead. The use of bronze or lead in the construction of the fountain is to be recommended on the score both of durability and sightliness; that of iron is generally condemned.

II. FORMATION OF PLEASURE-GROUNDS.

In the laying out of the pleasure-ground so much depends upon the size of the estate and the natural disposition of the ground—whether it is at a considerable elevation, more or less undulating, or low-lying, or level, or whether affected by local circumstances, that it is impossible to give any useful rules or instructions except such as are of a very general character. The extent and architectural style of the mansion, and the near or distant views, have to be considered in every case, so that to give complete details would be out of the question. In laying out new grounds, before anything is attempted the site and plan of the mansion or residence and of the necessary offices should be decided on, in order that the ground-work may not be delayed by alterations, or the planting and general arrangements interfered with when once the work has been commenced. It is of course desirable to have the building operations in a forward state before the ground-work is commenced. If the grounds have to be commenced contemporaneously with or before the building of the mansion,

it is very desirable that the landscape-gardener and the architect settle the respective levels of the chief entrances to the house; as on this matter being once and for all settled, the levels of the chief walks and carriage roads will depend. It is from these points that they start; and having been fixed by means of stout long iron bars driven into the soil, and further controlled by some other pegs driven into the soil some distance away at the same levels, all chance of mistakes arising are avoided.

Having decided upon the number and direction of the walks, large and small, the position of the boundaries and the contour of the land to be included in the grounds and garden, the ground-work proper may be commenced. Except in gardens where the amount of ground-work is large, and its removal costly owing to distance and quantity, the levelling usually required consists of taking sufficient soil from the higher parts to fill up the depressions and inequalities of the ground, and in obtaining easy undulations of surface when once fairly away from the parts adjacent to the mansion. These parts should form a level or nearly level plateau from which the mansion rises; and the walks hereabouts should be mostly straight and broad in proportion to the size of the building. There is no necessity for having the front door or carriage entrance on the same level as that leading directly into the garden, but there should, on fairly level land, be no great difference, small differences admitting of easy adjustment. The levelling being completed in the rough, the sites of shrubberies and plantations should be pegged out according to plan, and the land trenched and manured, and its depth added to by carting or wheeling the soil dug out from the future walks over the surface.

One of the first considerations will be the position of such trees as are required to give effect and to afford the required shelter. The selection of those that are to stand near the building must be ruled by the style of architecture. If the mansion is in the Gothic or pointed style, the trees that occupy the most prominent positions right and left, as seen from the front of the building, should be of a broad spreading habit, such as the Beech, Oak, Chestnut, Cedar of Lebanon, or Plane, these at once affording the required contrast to the lines of the architecture. Where the mansion is of the Grecian or Italian styles the trees that are to hold similar positions should be altogether different in habit, such as Conifers of a hardy character, viz. Douglas Fir, *Abies Nordmanniana*, *A. grandis*, *Sequoia*

sempervirens, *S. gigantea*, *Cryptomeria japonica*, besides *Thuias*, *Cupressus*, *Biota*, and columnar-growing *Poplars*, *Elms*, *Acacias*, *Alder*, *Oaks*, *Birch*, &c. It must not, however, be concluded that in the latter case these trees of pyramidal habit must predominate in numbers, for comparatively few of them will be sufficient to effect the required object. Similar upright-growing trees should also be interspersed, although sparingly, amongst the broad-headed trees that stand at some distance from buildings constructed in the pointed style, as they break the monotony that would otherwise exist were only such as have a spreading habit of growth employed. In all cases a sufficient number of trees should be planted at the eastern and northern sides, to afford shelter, and impart to the building an air of comfort. No arrangement, however satisfactory, in the more distant parts of the grounds, can make up for the bleak and uncomfortable appearance of a mansion when it is much exposed on those sides from whence come the chilling winter blasts.

Whether provided for shelter, or to give immediate landscape effect, no trees should be planted close to the residence. When the value of fresh air as regards health was not so well understood as it is at the present day, mansions were in numerous instances built on low ground, and then so masked with trees that the free circulation of air round the building was impossible. The habit of the trees to be planted should be known; the size to which they are likely to attain, or rather the spread of their tops, should be estimated; and, taking this into account, they should be planted so as not to approach, when of full size, within 10 or 15 feet of the structure.

It might be supposed in such an everyday operation as that of planting trees in the vicinity of a dwelling, few mistakes would occur as to the distances at which they are placed in relation to the building and to each other; yet such is by no means the case, for it is rather the exception than the rule to see trees intended to be permanent placed in positions where they will enjoy enough yet not too much room when they arrive at their full size. In planting trees, especially in the vicinity of a dwelling, it is of the first importance that the bulk of them should consist of only those kinds and varieties which have been proved to thrive in the district, for it is upon their healthy growth that the effect they will produce in after-years will depend. However handsome a particular kind of tree may be in situations which are

suitable, this should never induce the landscape-gardener to plant it in any place where there is any doubt of its succeeding. In determining the distance at which the various trees are to stand from a building, it is better to err on the side of not placing them too near. Those that stand nearest to it should have sufficient space to be clear of each other, even when they have attained full size.

The form, colour of foliage, and outline of the different kinds of trees employed should be well considered, so as to get variety in moderate amount,—too great variety tending to rob a garden of its restful aspect. Thus the appearance of any place, independent of the style of the building, is improved by the introduction of a limited number of the *Lebanon* and *Deodar* Cedars; their distinctly horizontal habit of branch growth contrasting well with either pyramidal or round-headed trees, and the pleasing tints of the foliage at all seasons, especially in the spring, are very telling, especially when introduced amongst those that are deciduous; but Cedars should not be planted close to the mansion unless the style and lines of the building are such as to warrant their being so placed. Again, the colour of the foliage in deciduous trees, both in their spring and autumn garb, should be taken into account in fixing their positions. The deep reds, bronze, and various shades of brown and yellow eventually assumed by the *Champion* and other American species of *Oak*, are especially telling when seen in contrast with the yellow of the *Elm*, the *Hornbeam*, the *Plane*, and numbers of others, which differ in the tints of their autumn clothing. When the trees that are intended to stand permanently are in their places, the filling-in with nurse plants becomes an easy matter. These nurses may consist of various common *Conifers*, whose cost price is low, viz. common *Spruce*, *Larch*, *Scots Pine*, *Austrian Black Pine*, and *Corsican Pine*; and of such deciduous species as *Alder*, *White Poplar*, *Horse Chestnut*, *Elm* in variety, *Willow*, *Sweet Chestnut*, taking care to plant no nurse tree that will greatly outstrip the permanent trees in annual growth. In any case, after the first four or five years, annual thinning of the nurse plants, or their reduction in size by pruning, will be necessary, for they should not be allowed to encroach on the permanent trees so as to injure the proper development of the latter, or stifle their lower branches, or encumber the ground longer than their presence is actually necessary; the object of planting trees in pleasure-grounds apart from shelter

belts being the attainment of perfect specimens, any undue crowding of the trees themselves or with nurse trees would defeat that object. In outlying belts and groups, which it may be desirable to encourage in height of stem and whose growth of lower branches is of less importance, the nurse plants may stay longer on the land, provided they undergo a certain amount of shortening back of their branches. Such nurse plants when cut down are sufficiently stout and long to serve as stakes for various purposes. The removal of deciduous nurse plants should be done with a sharp mattock, so as to cut through the stem below the ground level, and thus prevent the growth of suckers; whereas Conifers may be simply cut off as low as possible with a bill-hook. The extent of the planting now under consideration, and which may be looked upon as combining shelter with ornament, will, as a matter of course, depend upon the size of the grounds and other circumstances of a local character.

Approach Road.—The course which the approach road is to take must be well considered, and this again must be determined by the nature of the surroundings. As, however, road-making,

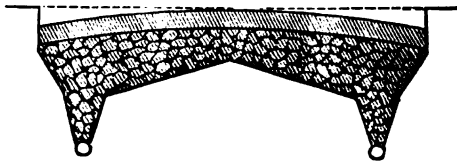


Fig. 237.—Cross-section of Carriage Drive or road for heavy traffic, showing side drain-pipes, rubble foundation, and finer material at the surface.

when well done, is expensive, and the position occupied by such a road as that here referred to has a considerable influence over other details in the general arrangement, it is a matter that



Fig. 238.—Cross-section of Garden Walk, not intended for heavy wheeled traffic. In heavy soils two side drains should be substituted for the central drain.

should be fully considered before being carried out. One principle may be safely laid down as to the position a carriage-drive is to occupy—it should not take such a line, if it can be avoided, as will cut in half or divide the park or grounds; neither should it skirt the boundary of the grounds so closely as to permit of the extreme outskirts being seen from it; neither should it, in the case of very extensive grounds, follow a

roundabout course that would have the appearance of increasing its length without adequate reason. The line of road when not straight should curve gracefully, but unmeaning deviations should be avoided. In its construction the first essential is to have its bed well drained by means of drain-pipes laid just below the bottom, and on both sides of the road. The foundation should be made with a sufficient depth of good hard material—not less than a foot or 15 inches in thickness. The bottom of a road should be slightly convex, so that if it consist of retentive soil the water is conducted towards the drains. Burned clay, which is generally known as ballast, and chalk, make excellent materials for the foundation, being porous and dry. If on 8 inches of this is laid about 7 inches of broken granite or blue rag, with an inch or two of fine gravel of a warm brown colour on the top, a road will be formed that will both look and wear well, means being of course provided (grips, or small sinks and cess-pits) to ensure the rapid draining away of some of the water falling on the surface.

Walks.—The course of the main road or drive having been determined, it is necessary to consider the position which the different walks are to occupy. The appearance of a place depends very much on these being laid out in the best positions and with due regard to utility; and they should always be so placed as to have the appearance of being necessary. If a walk be formed, as is sometimes the case, where it has no obvious use, it would be much better dispensed with. Care must be taken not to cut up or intersect unnecessarily the open spaces of lawn, for a broad expanse of turf is much more effective than when divided by a walk, unless, indeed, the walk be hidden from the best points of view in a shallow depression of the lawn, the eye being thus carried over it from the turf on one side to that on the other. This is a device which may be tolerated when there is an absolute necessity that a walk should take that particular line. Where curves are introduced there should always be an apparent reason for them. Where there is not actually some object, such as a clump of shrubs, or a single shrub or tree, to avoid which the course of the walk has been diverted, something of the sort should be introduced, otherwise the departure from the direct line is devoid of meaning, and on that account objectionable.

There is no part of a demesne where a greater necessity exists for good well-made walks than in

the garden and pleasure-ground, and upon the existence of these depends much of the enjoyment to be derived from a garden. There is no time when the grounds are more enjoyable than



Fig. 339.—Section across walk, showing construction suitable for a gravelly or well-drained soil. No artificial drain.

on a balmy summer's evening after rain; but if the walks are soft the pleasure is spoilt. Another obstacle to the enjoyment of pleasure-ground walks, and one which may too often



Fig. 340.—A graceful curve for a Garden Walk or Carriage Road.

be urged with good reason, is that they are made too narrow, a fault which should always be avoided, on the score of usefulness and appearance. Still, as in everything else, there



Fig. 341.—A good form of Walk-junction in a Garden or Pleasure-grounds.

should be a reasonable degree of proportion between the width of the walks and the size of the place, so that in grounds of great extent they should be proportionately wider than in others which are smaller.

Shrubberies, &c.—Trees and shrubs, when tastefully grouped, constitute the most effective features in the pleasure-grounds, and their effect is of so permanent a character that it becomes a matter of the greatest importance to select and distribute them with good taste and after careful consideration. The number of trees and shrubs employed, or, more correctly speaking, the area planted, should in all cases be in proportion to the size of the grounds. Nothing is more common than to see small places, or those of but moderate extent, overplanted at the first, which in reality is a greater mistake than the opposite extreme. It is indeed a grievous error of judgment, however interesting or beautiful the objects may be in themselves, to close every view in the garden itself, and beyond its confines, or to so arrange the planting that

no vistas exist, by dotting single trees or small groups of trees or shrubs over the whole area. Under this treatment pleasing effects are never realized, and a confused patchy appearance, without any repose, is the result. Many pleasure-grounds that were originally planted with judgment have been since brought into this overcrowded condition, more especially within the last quarter of a century, by the indiscriminate and excessive planting of new species of coniferous and other trees, which have too often been planted without due regard being paid to the space available for their full development. It may be laid down as a rule that the best and most extended views should be those obtained from the front of the mansion, unless, as is sometimes the case, owing to objectionable surroundings the garden and grounds are to be self-contained. From this point the greatest stretch of lawn ought to be brought into view, and the eye traverse the scene without interruption from intervening objects. Vistas should be secured in other directions, so far as the nature of the ground will permit of it, but these should be held subservient to the central or principal view. In the distance should be planted clumps of trees, varying in size according to the nature of the surface and the character of existing distant objects, some of which may require to be partially or wholly hidden from view, and others brought into harmony with the newly-planted groups.

There are several modes of planting a shrubbery or group of shrubs, the entire area of the soil being in some cases filled with shrubs, the taller-growing ones coming towards the middle or back, and those of smaller growth towards the sides or front; and in other cases a broad margin is left for the cultivation of flowering plants, either herbaceous perennials or those of a tender nature. The latter method is the one more commonly adopted; but there always comes a time when the shrubs should have the entire border to themselves, the turf being then carried up and amongst the front line of them. If flowers are desired in front of a shrubbery of fully-grown plants, it is easy to form borders or beds of them at some distance away.

These few remarks may be looked upon as having a general application, but the details in every case can only be worked out on the spot, as few places could be found where the nature of the ground and the surroundings are such as to admit of their being treated exactly alike.

In the selection of trees it is desirable to secure considerable variety. Deciduous trees, as well



RYDAL MOUNT
 EXAMPLE OF SHRUB-SCREENED SLOPE AND TREE GROUPING ABOUT A HOUSE
 (From Mawson's Garden Designs)



IN A WESTMORELAND GARDEN
 EXAMPLE OF EFFECTIVE GROUPING OF CONIFERS
 (From Mawson's Garden Designs)

as Conifers and other evergreens, should be used, not so much in a regular mixture of species as showing here and there a preponderance of particular species or varieties, such as may best suit the situation, or are found to thrive in the district. A list of the more desirable species and varieties will be found in another place, so that here it is only necessary to allude to them generally, and to particularize a few that especially deserve to be largely employed. As a tree for the pleasure-ground, either to stand singly or in a conspicuous place in front of others, the Tree of Heaven (*Ailanthus glandulosa*) has not been nearly so much planted as it deserves to be; neither have the American Plane (*Platanus occidentalis*), *Tilia americana alba*, a large-leaved variety of Lime with silvery tomentum on the lower side of the leaf, and a profuse bloomer; *Gymnocladus canadensis*, and *Liriodendron tulipifera*; all excellent garden trees. Other fine species for garden planting are *Sophora japonica*, a tree not of dense habit, but admitting of being partially seen through, and therefore suitable for planting in certain positions; the Maples furnish a number of not over-large trees, whose foliage dies off in the autumn in beautiful tints of amber, crimson, and yellow; the Ginkgo or Maidenhair-tree is a tree of erect pyramidal growth when the plant is a seedling, and remarkable in the form and hue of the leaf; *Magnolia acuminata* and *M. conspicua* (the Yulan). All of these retain their leaves late into the autumn, and have an immunity from the attacks of insects which is greatly in their favour. The same cannot be said of the common Lime, which is so much used, notwithstanding that it is often bare of foliage by the middle of August from the ravages of red spider.

The varied green hues of the Coniferous trees contrast well at all seasons of the year with those of deciduous subjects; but in the selection of the former, none should be chosen for this mixed planting in the pleasure-ground that has not been proved to be sufficiently hardy to stand the severest winters of our climate. This is a matter not always sufficiently considered. The great number of Conifers and allied trees that have been introduced to this country within the last sixty years has induced many persons to plant them largely, regardless of their suitableness for the position or of their requirements as to soil, &c. Such mistakes should be carefully avoided; some of them may thrive and look well for a quarter of a century, and then go wrong or be destroyed

by a frost such as that experienced in the winter of 1860-61, leaving gaps that it will take many years to fill. The better to avoid planting species of Conifers unsuited to the climate of these islands, except in the most favoured parts, the intending planter should consult *The Manual of Coniferae* brought out by Messrs. J. Veitch & Sons, nurserymen, Chelsea, than which no better exists. The beautiful *Cedrus Deodara* has been frequently planted in positions where even the common Larch could not grow satisfactorily, with the result that, instead of making a handsome tree, it has become stunted or one-sided, or anything but an ornamental object. This is, of course, a mistake which the planter could avoid by selecting trees of known hardiness, such as *Pinus Pinaster*, *P. maritima*, *P. austriaca*, and *Abies bracteata*, to occupy exposed positions, and placing Cedars of various species, *Sequoia sempervirens*, *S. gigantea*, *Taxodium distichum*, *Abies amabilis*, *A. concolor*, *A. grandis*, *A. nobilis*, &c., on the inner sides of shelter belts, or amongst groups or clumps of hardier trees, coniferous or deciduous.

At the present day it is sometimes recommended to mass particular kinds of trees in pleasure-grounds—and in extensive grounds isolated groups of dark evergreen trees, such as *Pinus austriaca*, *P. Cembra*, *P. Strobus*, or *P. excelsa*, may be introduced with the best results. Where planting is done on a large scale for broad landscape effects, as on the side of a hill, large masses of particular species may be employed with excellent effect. If, for instance, there exists a winding ravine of considerable extent, and this be sparsely planted with Conifers having dark-green foliage, and flanked with the ordinary mixed plantations, in which deciduous subjects to a large extent may predominate, the effect produced at a distance will be good; but in the pleasure-grounds, unless these are of great extent, this kind of planting should rarely be attempted.

So far as it falls in with the general idea of planting an estate, the hills, knolls, and higher parts should be planted with timber, the plantations to be carried down the slopes for a short distance in bold sweeps or straight lines; the lower slopes and the valleys being to a great extent kept free from trees of large growth. By planting in this manner the height of the hills is apparently increased, and the contrasts of light and shade made sharper.

In the case of pleasure-grounds, after the trees that are intended to remain permanently

are disposed in their places, then the intervening ground should be filled in with nurse trees that are only to remain for a time, until their size and the well-being of the permanent trees require their removal, a matter which has been previously noted. It may be remarked that there is a wide difference betwixt the treatment for trees in the pleasure-ground and such as are planted in woods with the object of producing timber; in the case of the latter it is essential so to treat them that a good straight trunk, free from branches, be secured, while in the pleasure-ground it is symmetrical development of form which is required; and with this end in view each tree, through all the stages of its existence, should have sufficient space to extend its branches to the fullest extent, and this cannot occur if thinning be not resorted to in good time. In grounds of small extent, where a belt of trees has been planted on or near the boundary line with the object of shutting out an undesirable object or poor prospect, it often happens that the trees are left to themselves to struggle for existence as best they may, until they become in course of time as naked at the bottom as hop poles, and the object for which they were first planted completely defeated; whereas, had the treatment been in accordance with the intentions of the planter, not only would they have formed a block that could not have been seen through, but each tree would have been a handsome object in itself.

These belts best serve their purpose when they consist of half a dozen rows of trees or even more. The species employed may consist of Maples, Sycamore, green and golden Yews, Lime, Horse-chestnut, Walnut, Crab, with a few Spruce and Douglas Firs, intermixed. The undergrowth may be Rhododendrons if the soil be suitable, Bamboos, Laurel, Holly, *Mahonia Aquifolium*, and Privet, which grow sufficiently high for the purpose of seclusion. The beauty of these belts may be increased by planting on the margins some of the numerous species of flowering shrubs.

In the case of the shrubs in the pleasure-ground it is very important, as with the trees, to make, first of all, a selection of those which will be permanent ones, and before planting to consider well how much space they will require when they arrive at their full development. As with trees, so with shrubs, it is better to err on the side of allowing them abundant space. When the permanent plants are in their places the intervals should be filled in with others which are to stand for a time only. In the

choice of these filling-in plants it is well, so far as is consistent with the demand for variety, to select such kinds as will readily bear transplanting, as, if this is not kept in view, many will ultimately have to be sacrificed that might, if of a nature to bear transplanting well after some years, be useful for removing elsewhere.

Shrubs being for the most part of a naturally bushy habit, they do not get naked at the bottom through insufficiency of space, to the same extent as do trees; yet they should by no means be neglected in this matter, as overcrowding is as fatal to their ever becoming perfect examples of their kind, which should be the condition aimed at in the case of every plant employed in places making any pretension to high-class culture. Before, then, the plants used for filling-in, encroach in any way upon those intended to remain as the permanent furnishing of the place, they should be thinned by degrees, as more space becomes necessary. Where the selection of kinds is suited to the soil and locality, the ground well prepared, and the planting properly carried out, shrubs, like trees, require little attention except this timely thinning—nature in their case not failing to play her part, if we only allow them the space they require.

Pruning may be had recourse to in some cases with advantage, especially amongst deciduous subjects, many of which will be all the better for some amount of cutting back when first planted, and for a few years afterwards. It sometimes happens that when a shrub is one of a choice species or variety, cutting back is preferable to entire removal. The knife should be sparingly used amongst evergreen shrubs, and never employed so as to destroy the natural habit of the plant. The practice of keeping the common and Portugal Laurels, Aucuba, &c., annually cut-in to limit their size, until they are as formal as if cast in a mould, is a most objectionable one when carried out in the shrubbery proper, or upon isolated specimens on a lawn. It is generally done to prevent fast-growing shrubs encroaching upon others, but it is much preferable, both on the score of appearance and in regard to the well-being of the shrubs intended to remain, to transplant some of them elsewhere.

The belief that many evergreen shrubs are injured by the application of manure, Rhododendrons especially, is a mistake. In sandy and infertile soils most species of shrubs are much benefited by the use of well-rotted manure, such as that of spent hot-beds; and an occasional

dressing of this kind ensures rapid growth. Hollies especially like it.

*The Rose-Garden.*¹—A garden without Roses would, at the present day, be considered a misnomer, for much as these flowers have always been prized, they have never before been grown so commonly or in such large quantities. Beautiful and acceptable as the blossoms always are, there is, however, one drawback to their cultivation in quantities in the immediate vicinity of a dwelling, for the plants, whether grown as standards, dwarfs, or bushes, when not in flower have an unpleasing appearance. In fact it cannot be denied, even by the most enthusiastic lover of Roses, that when not in flower a Rose plant has no decorative value. Still further, in order to afford them the treatment best calculated to produce their flowers in the finest condition and greatest profusion, the plants should be grouped by themselves.

All things being taken into consideration, a site for the cultivation of Roses should be provided in laying out any large garden. The Rose-garden should be located in some place apart from the more highly-kept ground, yet it must by no means be placed where it might suffer from the adverse influences of large trees, or where it would in any way be much confined, for were such the case mildew, the worst enemy of the Rose, would be certain to develop itself to such an extent as to make it difficult to deal with. A place should therefore, if possible, be chosen where the force of the winds from the west and north-west would be partially broken by distant shrubs or trees, but which would be quite open in other directions.

The natural character of the soil is a most important consideration, and in selecting a position for the Rose-garden, the nature of the soil, or the facility for providing the proper kind of soil, are matters requiring consideration. It should not be at too great a distance from the house as to be inconvenient of access, provided the conditions above referred to can be secured near at hand.

As a structural embellishment to a Rose-garden, nothing can be more appropriately introduced than a Rose-temple, or pergola, of elegant form. It should be simple in construction, and combine moderate cost with suitability for the intended object. "Every Rose-garden," observes Mr. W. Paul, "if of large, or even of moderate size, should be crowned or embellished with a Rose-temple; and indeed there are few flower-gardens which would not afford some nook which would be appropriately

filled by a light structure covered with climbing Roses, so that, if driven for shelter from the noonday heat or a passing shower, the eye may be pleased and the sense of smell regaled whilst kept waiting upon the weather."

American Garden.—A garden establishment having any pretension to completeness should contain some accommodation for the cultivation of the beautiful and free-flowering hardy shrubs commonly known as American plants: so-called from many of the species being indigenous to North America. The Rhododendron in its many hybrid forms is the most striking as well as the most varied of this class of plants, and when supplemented by Azaleas, Kalmias, Ericas, Andromedas, Daphnes, &c., is capable of converting the American garden, or that portion of the pleasure-ground in which the needs of these plants are especially provided for, into a perfect paradise of flowers. The preparations made for these plants, moreover, exactly suit the requirements of many of the most charming of hardy bulbs and herbaceous plants, such as Lilies, hardy Cypripediums, Trilliums, Gentians, and many others.

American plants require to be grown in a light, rich soil, readily permeable to moisture, but free from stagnant water. A sandy peat or heath-mould is the best; but a light rich sandy loam, if mixed with leaf-mould and rotten turf, answers exceedingly well. A chalky soil is wholly unsuitable, and in soils of an adhesive nature the delicate fibrous roots soon perish. If the soil is naturally unfitted for the growth of the plant, and peat cannot be had, a suitable compost in which to plant must be prepared. This may consist of equal parts of leaf-mould or other thoroughly decomposed vegetable matter, rotten turf, sandy loam, and sharp sand—the whole to be thoroughly incorporated, laid in a heap for some months previous to use, and frequently turned and mixed together. Where plenty of leaf-mould is at command, a greater proportion of that material may be employed, especially when the loam is not of a very light nature, in which case more sand should be incorporated with the other materials.

The situation should be moist, and not overhung by trees, for these would prove injurious by the drip from their leaves, and by the incursions of their roots, which would not only impoverish the soil, but absorb enormous quantities of moisture from it, and this at a season when the plants are in danger of suffering from dryness at the roots, a point to be particularly guarded against.

¹ See chapter on *Roses*.

In preparing beds for American plants in retentive soils, it is a matter of great importance to secure proper drainage in the first instance; for, though requiring abundance of moisture, the roots cannot long survive when this becomes stagnant in the soil. Should the staple consist of peat or heath-mould, the ground, after doing the required draining, will merely require to be trenched, a small quantity of well-decomposed cow-dung or any light rich compost being mixed with it in the operation, and if deficient in sand a due proportion of this substance must also be added. Where the natural soil is not suitable, it should be dug out in September or October to the depth of at least 18 inches, or better, 2 feet, and the subsoil loosened to a foot in depth. The peat or compost having been chopped up it should be filled in in such quantity that after sinking it may be no higher than the adjoining ground; indeed, in dry situations it is advantageous to have the surface of the beds a little below that level, in order to secure a sufficiency of moisture, and for a like reason it is not advisable to elevate the middle of the beds higher than the sides.

*Decorations.*¹—These consist principally of summer-houses, arbours, and temples, in addition to those already mentioned in the preceding sections of this chapter. Summer-houses are both appropriate and useful structures in the pleasure-ground and flower-garden. The unbarked timber formerly used in making them had, when newly put up, a nice appearance of rusticity; but even with the greatest care in selection, and in felling the timber at the season best calculated to enable it to retain its bark, the moisture getting betwixt it and the wood would cause it quickly to peel off, thus giving an unsightly aspect to the structure. Tough, durable wood, such as Oak, Yew, and Elm, should be used in a sound, seasoned condition, and when put together it should be well varnished. The roof should be thatched with heather or reeds, and no other covering looks so well as the former, or is more appropriate, besides which it is very durable if cut in the winter. Reeds are also durable, lasting from ten to fifteen years if the slope of the roof is 45° or greater. Many persons object to wooden summer-houses, alleging that they harbour insects to such an extent as to make it unpleasant to sit in them. Such no doubt is the case if they are improperly made. The inside should always be lined with close-jointed boards, and the whole then stained a warm brown or dark-green colour. To avoid

¹ See also under *Structures*.

dampness, the floor should be composed of boards, tiles, or parquet-work, and raised several inches above the ground.

Arbours, if judiciously placed, are, equally with summer-houses, in character in a garden, whether it be large or small. They may be formed in various ways. A weeping Ash or Elm, with closely furnished shoots and foliage, will serve the purpose well; or a light framework of iron may be erected on which to train vigorous-growing Roses, such as the Crimson Boursault, Ruga, Felicité Perpetue, or varieties of the evergreen or Ayrshire types, or, indeed, any free-growing varieties or species, which may be budded in places with others which produce finer flowers, in order to afford variety. Other climbing-plants adapted for this object are the Honeysuckles, *Aristolochia Sipho*, *Tecoma radicans*, the Clematises, the Vine, and Virginian Creeper.

Ivy is one of the best and most manageable of evergreen subjects that can be employed in covering an arbour. Although in this country we do not use it so much as is done on the Continent, this plant may be freely and safely recommended for the purpose in question; its thorough hardiness in every part of the kingdom, its free and close habit of growth, and its immunity from insects, are properties which specially adapt it for such an object; while its evergreen habit is also deserving of consideration, since, whatever position it occupies, it looks much better through the winter than plants that are deciduous. Vigorous-growing varieties should be selected, and several may be planted on the same arbour to produce a variegated effect. To have the arbour covered with as little delay as possible, plants should be used that have been grown in pots, and which are from 3 to 6 feet in height. Over the usual iron framework of which the skeleton of the arbour is constructed, should be laid stout wire-netting, to which the shoots should be trained. This training must be often and regularly attended to from the time of planting until the whole is closely covered, otherwise the shoots, as they grow, will be injured and their growth hindered by chafing against the wire. When the whole is covered little will be required except to go over it with the knife two or three times during the season, in order to trim in long and straggling shoots.

In these structures the seats may either be fixed all round the interior, as is usual, or chairs may be used, according to individual taste. The floor may consist of shingle, hoggins, i.e.

gravel of the size of horse-beans, smooth concrete, or it may be paved with moderate-sized blocks of wood set on end, or, if well elevated, the floor may be of boards laid upon wooden joists. Arbours and summer-houses should, if possible, be placed with the entrance facing the south, or nearly so, as in such position they are much more pleasant to sit in. An arbour affords very agreeable shade in hot, dry weather during summer; but in our climate the advantages of a rain-proof roof and dry interior, such as a summer-house affords when properly constructed, are not to be lightly disregarded at any season. The summer-house, moreover, equally with the arbour, may be decorated on the exterior with such flowering climbers as Clematises, Honey-suckles, Roses, &c.

Temples may be considered as belonging to the more distant parts of the pleasure-grounds or gardens of large extent, where they often form a distinct and attractive feature. They should possess some correspondence in style, and in the material used in their construction, with the mansion. Even the best imitations of stone are only just admissible, always having a poor appearance. The finest kind of bricks, with the addition of terra-cotta as quoins, jambs, lintels, &c., if their colour is such as will not offend, harmonize with the greenery of a garden, and a building may be made as ornate as the owner pleases. Stone is, in reality, the best material to employ in building a temple, as it conveys the idea of durability. The position is another important matter; if the grounds are large, a distant spot, somewhat elevated, especially if partially hidden by trees from the windows of the mansion and its immediate vicinity, may be chosen with usually good effect; or if there happens to be a straight broad walk or vista of turf or gravel, a temple may be set up as a termination to it, thus giving an apparent object for the existence of the latter, without which it might in some cases appear meaningless.

III. LAWNS, BOWLING-GREENS, ETC.

There is no feature connected with a garden in this country which adds more to its picturesqueness, or is more important, than a spacious, well-made, well-kept lawn; we say, well-made, as on this in a great measure depends the possibility of keeping the turf in good condition in after-years, for no amount of labour expended on a badly-made lawn will keep it in a satisfactory state throughout the year. The

extent and form of the lawn will, as a matter of course, be determined by the circumstances appertaining to each individual place; suffice it to say, that the larger the area of lawn, if well laid out, the finer will be the general effect. The continued close mowing with machines, which lawns are subjected to at the present day, is an additional reason for bestowing great care on the making, an uneven surface offering great obstacles to good mowing.

Where the soil is naturally of good quality and fair depth, the formation of a lawn presents but few difficulties. If the site be not sufficiently dry, it should be made so by draining, and it will be necessary to complete this operation before anything else is attempted. This draining of the soil of stagnant moisture should at the same time be carried out, so far as is requisite, throughout the whole of the grounds, whether under grass, or planted with trees and shrubs; the work being performed in a similar manner to that indicated for the flower-garden proper. After the drainage has been attended to, it will be necessary to determine the level or levels of the surface; which is indispensable to enable the whole to be dug to a uniform depth. In most cases the level of the ground in the immediate vicinity of the building is regulated by the ground-line of the walls, or terraces if such exist. The general level of the undisturbed ground must then be ascertained, in order that if any difference be found soil may be added or removed as the case may require. Newly moved earth will for a time be higher, but when well soaked with the rains it will settle to the measurements taken before it was disturbed. The whole area should then be trenched evenly to a depth of from 15 to 18 inches, where there is this depth of soil of fair quality.

A lawn should maintain a fresh green appearance even in dry weather; and if the natural soil is not at least 1 foot deep, as much should be added as will bring it up to that depth, or in dry seasons the choice will be betwixt a brown-patched surface, or the application of frequent and heavy waterings, which operation (unless where there is a good water supply laid on by means of pipes) becomes costly on account of the labour involved. Where the staple is poor and sandy, a liberal quantity of retentive and better soil should be added. Where a lawn of considerable extent has to be formed, this addition of new soil may appear a formidable task, but it should be borne in mind that a lawn is a permanent feature, and when once the work is well done it will not require redoing. Let the depth,

whatever it may be, be uniform, not alone that of the surface when finished, but the subsoil surface, to the point where the spade or pick has gone, should be as even as possible, so as to give the whole body of loosened earth an equal depth over the entire area; this, and no other method of procedure, will ensure a perfectly plane surface. If the loosened earth is deeper in one place than another, the subsidences will be unequal and the surface will become uneven—a condition which, so long as it exists, will spoil the appearance of a lawn. Besides, it is much more difficult to remedy defects of this nature afterwards, than it is to do the work properly at the first. Lawns which are uneven are much more expensive in the keeping than smooth and even ones, and not only this, but the colour of the grass is not uniform. The reason for this difference in tint is due to the elevated portions being shaven to the quick, whilst the grass in the hollows is left comparatively long; the former presenting a pale hue for several days after mowing, the latter a bright-green one, giving the lawn a spotty aspect.

When the trenching is completed, the surface should be gone over with the spade and rake, leaving it quite level and smooth, in which condition it should remain for a considerable length of time to allow it to settle. If the work is completed in the autumn, the rains of the winter months will solidify it, and bring it into proper condition for being turfed or sown, whichever is preferred.

If good turf, perfectly free from weeds, or daisies, or coarse grasses can be procured, a good lawn can be obtained without delay, but it should be laid and rolled a few weeks before the dry season comes on, to allow the turf to get root-hold, otherwise a season will be lost, and the appearance of the lawn that season will be spoiled. The turves should be uniformly cut and rolled up; this is done near London in yard lengths, 1 foot broad, and about $1\frac{1}{2}$ inch thick; and in other parts in squares of 1 foot. They should be laid as soon after cutting as possible and evenly beaten down with the turf-beater, going over it again thoroughly when the whole of the turf is laid. Pass a heavy roller over the new turf as soon as the beating is completed, and after doing that do not touch it until growth has made some progress and the roots have penetrated the soil.

Where really good turf cannot be obtained, it will be necessary to have recourse to sowing seeds, the best season for sowing being the period of two or three weeks about the end of

March and beginning of April, or early in September, the showery weather we generally experience at those times being favourable for the germination of the seeds. The ground should be prepared for sowing in the same way as was advised where turf was to be laid; it must be made solid by treading and rolling, and reduced by working and raking to a perfectly level and smooth surface. Whenever possible, the margins of the walks and flower-beds should be laid with a continuous belt of turf, if it be but half a foot in width; this should overlap the true edge, so as to allow of a new edge being cut when the proper time comes, that is, when the turf has begun to grow. This strip should be laid as true and evenly, and be as well beaten and rolled, as is advised for an entire lawn. When turf for this purpose is not available, the margins should be made up with retentive loam, and wide enough to allow of an inch being cut off. When the ground is in proper order, and there is no strong wind blowing, sow the seed and work it in with a wooden rake. Some gardeners have pieces of board 2 to 3 feet long and 1 foot wide fastened to their boots when sowing, so as to avoid foot-prints. To finish the job, give the ground a light rolling. In some places birds are very troublesome on newly-sown lawns, devouring the seeds in large quantities if not scared off; this is a matter that requires attention, or the crop may be too thin, and this will entail re-sowing, and that at a season when the weather is too dry for seed germination.

The grasses best adapted to form a lawn embracing the desirable qualities of fineness of leaf, beautiful delicate green colour, and slow dwarf growth, to obviate frequent mowing, are:—

<i>Cynosurus cristatus</i> (Crested Dogtail),	50 lbs.
<i>Festuca ovina tenuifolia</i> (Sheep's Fescue), ...	25 "
<i>Poa nemoralis</i> (Wood Meadow Grass),	25 "
	<hr/> 100 "

Clover is not recommended, as the best lawns are composed exclusively of grasses, but if it is desired, a very small quantity of white Clover may be added. When the lawn is much shaded by trees, the quantity of *Poa nemoralis* should be proportionately increased.

Thick sowing is necessary for the production of a fine close turf; 80 lbs. per statute acre is a suitable quantity. March or April or during September are, as already stated, the best times to sow the seeds, but they may be sown in May, June, and July, if the weather be not too hot and dry.

For two or three summers after a lawn is made, all weeds should be regularly spudded out, or killed by dropping poison into the hearts of the plants, or they will quickly increase, entailing endless work in after-years. Coarse grasses and daisies should in like manner be extirpated. Daisies, although at first only existing in small quantities, if not got out by the roots will increase rapidly where a mowing-machine is used, as their flower-heads are often thrown over the collecting box; and although the seeds may not be matured, still some of them will vegetate and grow into flowering plants. Lawns which are sown should not be very often or very closely mowed the first year, and the scythe is a better implement than the machine to use during that period. Previous to the first mowing in the spring the lawn should receive one good rolling with a heavy iron roller, to solidify the ground, which the winter's frosts will have loosened.

Sometimes before laying the turf the surface is covered with sifted coal-ashes, in order to keep the lawn free from worm-casts. The latter are troublesome, it must be admitted, but raking and sweeping will disperse them. We do not, however, approve of too much sweeping up of worm-casts, unless where excessively numerous, or for some special occasion; they are the means by which nature manures the grass, as well as drains the surface. Being composed of fine soil the greater part of the worm-casts is washed in among the roots of the grasses, forming a top-dressing which is peculiarly beneficial to the finer species—in fact, it is that kind of top-dressing in which they exist for ages in perpetual verdure in the wild state on our downs and commons. On the whole we should not be inclined to use any precautions against the worms at first; but if the soil is naturally so light and porous that their assistance is not required, they may be brought to the surface at any time by an application of clear lime-water, when they can be swept up.

The elastic surface of a mossy lawn is preferred by some to the less yielding grass. The worst feature connected with such a lawn is that in dry weather it is certain to become brown, unless the ground is wetter than it ought to be. To remove moss, manure of different kinds is used, such as loam and rotten dung, soot and loam or guano, but all these are so far objectionable that they cause the grass to grow rank and strong. To obviate this, apply a dressing of lime in a powdered state mixed with maiden loam in proportions of one part lime to three

parts of loam, or wood-ashes may take the place of the lime. Care should be taken that the loam is new and free from weeds, or the cure will be worse than the evil sought to be remedied. A dressing of from $\frac{1}{4}$ to $\frac{1}{2}$ inch will be sufficient, and it may be applied at any time during the growing season when the weather is showery, so as to get it covered in without delay. April or October are the best months for applying the mixture; and before it is spread on the lawn, much of the moss should be raked up. A similar dressing may with advantage be afforded to old lawns, or those that have become exhausted, especially if grass seeds are first sown, and the compost applied afterwards, the dressing being repeated from time to time as may be found necessary.

Bowling-Greens and Lawn-Tennis Grounds.—Space for a bowling-green or lawn-tennis ground may be provided in any part of the pleasure-ground where they would not interfere with the general arrangements, or with the pictorial or landscape effects. So far as using the ground for the purpose of bowling goes, any level portion of lawn might be taken, but if used much the grass is apt in very dry weather to get bare in places and become unsightly. Hence it is better that spaces of sufficient size should be selected in some part of the grounds, and skirted by a walk passing by and amongst groups of shrubs planted in order to screen them in part, and in the case of a bowling-green, the surface being sunk about 6 inches, so as to retain the bowls. It is usual to have near these play places a covered seat or a summer-house, and, in years gone by, when the game of bowls was more practised than at present, the green was often surrounded with a high hedge of Hornbeam, Beech, or Holly, which, being kept nicely clipped, shut out the wind effectually.

A bowling-green then is usually made in what is known as a sunk panel. To form this the top soil is removed, and about half a foot of the sub-soil excavated. The surface soil is then replaced at the lower level, the plot being of course well drained. Where thus formed, even if the ground is naturally dry enough, it becomes necessary to have on each side drains, with gratings of small size at the surface to carry away the surface water, which will, during heavy rains, collect upon it. When thus formed in a sunken panel, the surface may be flooded in the winter, for the purpose of being converted for the time into a skating-rink, but in this case the drains above referred to must be temporarily closed.

In forming a bowling-green it is always well to make it sufficiently large, so that when required there will be room enough for several games to be going on at the same time. The centre of the green should be a few inches higher than the outsides, yet not so much as to be perceptible to the eye, this slight inequality being intended to test the skill of the players. The soil of which a bowling-green is made should be good in quality, and of sufficient depth to be able to maintain a thick dense sward. As in the case of lawn-making, the whole should be well-trenched to an equal depth, allowing it afterwards time to settle before turving or sowing down. If really good turf can be obtained, free from large weeds, and possessing a thick close carpet-like sward, it will be preferable to having recourse to seeds. In laying it down the greatest care must be taken that the turves are of equal thickness, and that the work is done with the greatest regularity, as regards making the joints close, and the surface faultlessly even. Greater care is necessary here even than in the case of a lawn, for not only must the surface be smooth to the eye, but actually so that the bowls will roll over it almost as if on a billiard-table, and this cannot possibly be the case unless the turf be well laid in the first instance. No amount of rolling afterwards will bring it to the condition required, if it be not laid down evenly. The attention required for the proper keeping is the same as that recommended for lawns in general. Should any coarse grasses or weeds spring up they must be at once removed.

Where turf cannot be had of good quality, recourse must be had to sowing seeds. The sorts recommended for lawns will answer, but to ensure a thick close sward in the shortest time, we should advise the quantity of seed to be increased one-third. The ground should not be played upon until it is well and thickly clothed with grasses.

The immediate surroundings should not consist of large trees, or the shade thrown by them will cause the grass to grow weakly. A border of mixed evergreen and deciduous flowering-shrubs may very appropriately be planted round the green, either as a screen or a decoration, and beds of herbaceous flowering-plants may with good effect be introduced amongst them. The bowling-green, in fact, best realizes its true position when it comes in as an interesting feature in the circuit of the dressed grounds which surround a substantial residence.

Lawn-tennis grounds should be level and smooth, but there is not the same need of perfect finish

as with a bowling-green; still, firmness and dryness are essential points of a good ground. There is no necessity to form the place of play at a lower level than the surrounding lawn surface, and good ordinary turf answers as well as the finest grass mixtures. With a view to hindering any undue wearing away of the grass, a tennis lawn should be made, where the area of lawn is sufficient, at least 45 yards in length with a width of 25 yards, which will permit of some shifting of the nets occasionally, or the accommodation of two or more parties of players at one and the same time.

IV. ORNAMENTAL WATER.

In pleasure-grounds of considerable extent, or in home parks which lie beyond the more carefully tended grounds, and of which they generally form a continuation, ornamental water is an important feature, not only on account of the attraction which a well-arranged sheet of water in such a position always possesses in itself, but for the marked effects it has on the surrounding landscape. In flower-gardens the extent of water is necessarily limited; otherwise it would be out of proportion to the area of land seen in connection with it, and accordingly it is chiefly confined to basins and fountains, as already explained. In extensive pleasure-grounds and in parks, water is, on the contrary, so important a feature and contributes so much to the beauty and enlivenment of the scenery, that no landscape can be considered altogether complete if it be not present.

In nature, from a certain point of view, a river, broad and swelling, may in winding be observed to disappear behind some wood or rising ground, and reappear in full view, till by taking its course through valleys, or low grounds, it finally becomes lost to sight; but what is seen of it has a much more attractive appearance than the same extent of surface in the form of a broad lake. Now, an artificial piece of water can be formed so as to appear and disappear to the spectator like a natural, winding river, and then no one can reasonably find fault with it on the score of appearance. Comparatively few demesnes, however, can boast of a river of any importance winding through the grounds, and even where such a stream exists, the water is often so far below the banks as not to be visible at a moderate distance. But where a stream of water either flows naturally through the grounds, or can be diverted so as to pass through them, effects of the most pleas-

ing kind may be produced if the work be designed and undertaken with skill and judgment. Where the character of the ground is favourable, nature may be so closely imitated as to leave little to be desired. Deviations in the course of the stream may be made so as to represent natural windings and irregularities of breadth, while elevations and depressions in the height of the banks may be worked out, the earth that

is excavated in the one case being turned to good account in the other. In the planting that is done at intervals on the banks, the sight of the water can, if desirable, be shut out in places so as to give the whole a still more natural appearance, and there may be other details that the situation may specially favour, such as masses of artificially arranged rock-work abutting on and overhanging the water, to be planted



Fig. 342.—A Corner in a Water-garden.

with shrubs and trees, or rock plants of a suitable kind; or it may be left in great part bare of vegetation as taste may dictate. In some elevated spot a temple-like retreat or a pagoda in Chinese style may be constructed, or a simple seat placed. A boat-house of an ornamental character might occupy one of the deeper bays; and in front of this a Venetian or Chinese harbour, with stout ornamental posts driven into the bottom of the lake for securing boats to in the summer months, might find place. This part of a lake could be rendered very picturesque by the employment of Chinese or Japanese porcelain seats, bronze or stone lanterns and fencing. In places where an extended river-like character cannot be arranged the more simple lake-like form may be adopted; but here everything calculated to produce an artificial pond-like appear-

ance must be carefully avoided, not only as seen from a distance, but upon near inspection.

Where a lake is of many acres in extent, small islands are admissible if so placed as to form objects of themselves to be viewed at a distance, so that they do not interrupt more desirable distant views. Such islands may be planted with Willows, Rhododendrons and other shrubs of low growth; Bamboos and the deciduous Cypress are also suitable for such positions. No island should be entirely planted, but grassy spaces and glades should be left. And as no lake seems to be quite furnished without bird life, these islands, from their quietness, form excellent breeding-places for water-fowl.

The size of a lake, its distance from the mansion, or from various points of view in the grounds or garden, and its relative position as

regards distant and near objects, will determine the character and manner of the planting.

That a pond or lake of any considerable size should be destitute of all assistance from tree or shrub, seems opposed to nature as well as to good taste, and we would say that a piece of water which will not admit of being planted round about in certain parts, is itself in the wrong place. Trees and vegetation generally seek the water all over the world; but the trees that the landscape-gardener should employ are those which succeed when in the neighbourhood of water, such as Willows of all kinds, Alders, Catalpas, American Oaks, Acers, Siberian Crabs, Weeping Ash, Taxodium, Savine, the Yews, &c.

On the more elevated parts of the banks the plants may consist of Hazel, Sea-Buckthorn, Thorns in variety, *Arundo Donax*, and the variegated variety of this species. *Forsythia suspensa*, Quince, Philadelphus in variety, Snowberry, this also in damper places; Lilacs, *Cornus sanguinea*, *C. alba*, Laburnum, Pampas Grass, Bamboos, and some of the larger herbaceous perennials. Should the lake or stream be totally detached from the pleasure-grounds, the more appropriate plants would be those that are indigenous to the country, or are the least costly. These, if employed with taste and judgment, and in large or small masses, have as good an appearance as exotics, even those which may be equally as hardy.

One thing should always be well considered before any attempt is made in the introduction of artificial lakes, and that is, that the stream which affords the supply of water should be large enough in volume to keep the whole pure and in a clear state. It does not require nearly so much water to do this as might be imagined, even when the body of water in the lake is large, but the flow should be continuous, or during long droughts the water may become offensive, not only in appearance, but on account of the exhalations proceeding from it—in which case, instead of having the effect intended, it would become a nuisance and a danger to health. As a further means of preserving a clear, wholesome body of water, it should have an average depth of 3 feet.

Towards its exit the lake should have a depth of from 6 to 8 feet to the bottom of the penstock, so that in case of its becoming foul at any time, or for the sake of securing the fish which it ought to contain, it could be rapidly emptied. The ordinary exit of the water should be the so-called frog's mouth, a long slit-like aperture

of 6 inches in width, and from 12 to 20 feet in length, according to the size of the lake. If it be a stream artificially widened out, no dam at the lower portion would be required unless the descent is very rapid, when a kind of waterfall might be desirable for the purpose of retaining the water at all seasons at its proper level. If a lake is fed through a pipe from a river, this should be furnished with a sluice, which should be closed when the river water is in a dirty state, as is the case at the time of floods or after rain-storms. Failure to do this results in the gradual filling up of the lake with mud, the removal of which is often troublesome and costly.

In the shallower parts and on the margin of the water, in positions where they will produce the most natural effect, groups of water-loving plants should be introduced, such as Nymphæas, Nuphars, Sedges, Reeds, Bullrush, Flags, &c. This can easily be managed, as near the edge the excavation need not be deep, and fitting accommodation can readily be afforded for them.

All walks in the vicinity of natural or artificial water should be rendered dry, otherwise the scenery cannot be viewed in comfort. There may, however, be a piece of smoothly-shorn lawn of varying width between the walk and the water's edge.

From what has been said it will be seen that a lake offers considerable scope for excellent landscape effects.

Some lakes are of such modest dimensions that arboreal planting is scarcely admissible, and the decorations on the banks must perforce consist of shrubs, herbaceous perennials, and alpine plants disposed in small colonies.

Where confined water is not convenient, the water-side garden may be by a brook or stream side. "Landscape-gardeners seem to have put a higher value on the lake or fishpond than on the brook as an ornament to the garden; but while we allow that many places are enhanced in beauty and dignity by a broad expanse of water, many pictures might be formed by taking advantage of a brook as it meanders through woody glade or meadow. No such beauty is afforded by a pond or lake, which gives us water in repose—imprisoned water, in fact; and although we obtain breadth by confining water, still in many cases we prefer the brook as it ripples between mossy rocks or flower-fringed banks. The brook-margin offers opportunities to lovers of hardy flowers which few other situations can rival."—(*W. Robinson.*) [F. M.]

CHAPTER XXIII.

HARDY ORNAMENTAL TREES AND SHRUBS.

HARDY TREES AND SHRUBS—HARDY CONIFERS—SEA-SIDE AND TOWN TREES AND SHRUBS—SEA-SIDE PLANTING—TREES FOR CHALK SOILS—TREES FOR TOWNS.

1. HARDY TREES AND SHRUBS.

The increase in the number of cultivated trees and shrubs during the last fifty years is most noteworthy. Probably over three thousand species and botanical varieties of hardy trees and shrubs are now in cultivation. They are chiefly natives of North America, Northern Asia, and various parts of Europe; only a small proportion coming from the Southern Hemisphere. There is now at the gardener's command a wealth of material which, alike in quantity, beauty, and variety, far surpasses that of any previous period. In the selection here made the aim has been to include only the most beautiful and distinctive of those that can be cultivated out-of-doors in these islands. The term "hardy" as given to any particular plant applies with varying force according to the latitude or locality in which it is grown. As a general rule the number of species which can be grown in the United Kingdom without injury by frost increases as we proceed from north to south and from east to west. There are, however, many exceptions. In the west of Scotland, for instance, there are localities more favourable to the cultivation of exotic trees and shrubs than the midland counties of England are. Situations near the sea are as a rule favourable to tender plants, compared with places beyond its ameliorating influence. Thus, such towns as Scarborough and Cromer on the east coast are warmer in winter than inland towns of the same latitude. Cornwall, being affected on both sides by the sea, is about 10 degrees warmer in winter than the London district; so that many plants are grown out-of-doors there which at Kew require the protection of a greenhouse.

In the following pages many species are mentioned that will only bear the winters of the south and south-western counties of England and Ireland. Plants from New Zealand and South America belong, with some exceptions, to this category, and the same may be said of those that have been introduced from the southern portions of Japan and China. In each case this fact is noted. Where no allusion

is made to the matter they may be considered as hardy in all but the most inclement parts of the kingdom. In connection with this question of hardiness it may be worth while to remind those who are desirous of making fresh additions to their collections of shrubs, that the capability of withstanding severe winters in the case of many species increases as they become older. Whilst young plants under three years old will be killed off wholesale, others that have reached the adult stage will pass through the same degree of cold quite unaffected. In making trials of doubtful species, therefore, healthy strong specimens should, if possible, be secured, or in the case of young plants protection afforded for a few winters.

Before planting new gardens it is advisable to ascertain what trees and shrubs thrive best in the neighbourhood, or where similar conditions as to soil, moisture, exposure, and altitude obtain. Many species that fail through starting too early in spring when grown in warm, humid situations, will succeed in exposed or elevated positions, where the wood becomes better ripened and a later start is made. In many places the subject of shelter or nurse trees will have to be considered, especially where there is exposure to the north and east. With many shrubs, more particularly tender evergreens, the fierce, biting winds from those quarters do infinitely more damage than merely low temperatures, provided the air is still. The hardiest evergreens are best for purposes of shelter, and such trees as the Holly, Austrian Pine, and Spruce may be associated with Larch, or where an immediate effect is desired, with the quick-growing Poplars. Numerous other deciduous trees may be used, such as the Hornbeam, Sycamore, Beech, and Lime. Such evergreen trees as the Yew or Holm Oak are of great value as screens, but they are slow-growing. In chalky districts many Conifers succeed; on the other hand, Rhododendrons, Heaths, and other Ericaceæ as a rule refuse to grow in soil permeated by lime; in such districts specially-prepared soil has to be provided. The majority of hardy trees and shrubs thrive best in deep, moist soil, but some are much better adapted to poor, light soils than others. Some of the Cytisuses and Genistas, for example, make large bushes and flower with greater freedom in poor soil than when more liberal treatment is afforded. For planting near water the following may be mentioned:—Willows, Alders, Poplars, the bald Cypress, Bamboos, Catalpas, Diervillas, Philadelphus, Lilacs, Sea-Buckthorn, &c.

Few shrubs will grow under the Beech, or in Pine plantations; but the following succeed in the shade, or partial shade, of most other trees, those first mentioned being the best adapted for the purpose:—Ivy, Periwinkle, *Hypericum calycinum*, Yew, *Gaultheria Shallon*, Ruscus, Box, Snowberry, Hedge-Maple, Hazel, *Euonymus radicans*, *Berberis Aquifolium*, *Daphne Laureola*, Ribes, Elder, Privet, Broom, Rhododendron, Holly, Laurel, and Laurustinus.

For planting in large towns, deciduous trees, such as the Plane, Horse-Chestnut, Lime, Sycamore, and Elm, are among the best of the larger trees; whilst of smaller, flowering kinds, Lilacs, Laburnums, Almonds, and Thorns are recommended. Of evergreens the Hollies, Box, Aucubas, Phillyreas, Holm-Oak, Euonymus, and Privets are suitable. Some of the best climbers for towns are the Ivy, Virginian Creeper, *Ampelopsis tricuspidata*, Wistaria, *For-sythia suspensa*, *Jasminum nudiflorum*, Common Jasmine, and *Crataegus pyracantha*.

A few words may be said on the question of the arrangement of shrubs in borders or beds. Instead of the indiscriminate mixing which is so frequent in the garden, the aim should be to group the plants of the same species, either by themselves, or in association with others whose foliage or habit will enhance their attractions. The beautiful Mezereon, for instance, is more attractive where sufficient plants are brought together to cover a few square yards than when it is dotted about singly; and its beauty at the season of flowering is brought out even more effectively if a dwarf evergreen, like *Gaultheria procumbens* or *Ruscus hypoglossum*, is planted as a groundwork to supply the foil of dark-green which the Daphne, in its then leafless condition, lacks. The Japanese Witch Hazels (*Hamamelis*), whose yellow flowers are amongst the earliest harbingers of spring, require a similar accompaniment of dark-green against which the bright yellow flowers may show in vivid contrast. The purple-leaved *Prunus Pissardi* and the yellow-leaved Mock-Orange, or *Cornus alba*, var. *Spathii*, make an effective combination. It is not suggested that in small gardens the space at disposal should be occupied by large masses of a few things, and variety sacrificed in order to produce a few broad effects. To one who really loves plants the more species and varieties his garden contains the greater pleasure will it afford him. The idea is, rather, that the shrubbery border is more effective, and the beauty of a plant better shown, when it is represented by a group

of specimens than when they are distributed singly.

In large gardens a feature of great beauty and interest may be made by setting apart a piece of ground in which shrubs, trees, and small plants can be allowed to grow their own way, a kind of "wild garden" in which the hand of the gardener is not evident. Such a garden is best on the outskirts of the garden



Fig. 343.—*Arundinaria Simon.*

proper, forming a connecting link between it and the park or woodland beyond. If possible it should have a varied, undulating surface upon which a few scattered trees are growing; and disposed amongst these, in informal groups, should be masses of free-growing Roses, various species of Rubus, Diervilla, Syringa, Philadelphia, Cotoneaster, Berberis, and numerous other shrubs native and foreign. Groups of large herbaceous plants, Snowdrops, Bluebells, Daffodils, and other bulbs may be used with excellent effect. A few evergreens are needed for winter effect, such as Box, Holly, Laurel, and Rhododendron, allowing them to assume their natural habit. Luxuriance of growth is, of course, a first essential, and this means that the same care in trenching, manuring, &c., is as

necessary as in the formation of ordinary borders or beds.

Bamboos.—These hardy evergreens, of which some forty different kinds are cultivated in Britain, are, with one or two exceptions, natives of China or Japan. They are described under ARUNDINARIA, BAMBUS, and PHYLLOSTACHYS. The recommendations of these plants are their unrivalled gracefulness, their free and quick growth in favourable situations, and the



Fig. 244.—*Phyllostachys nigra*.

peculiar quality they possess of retaining their leaves in a healthy green condition all through the winter, even when many other evergreens have put on a dull and sombre hue. Their one drawback is that after a severe winter a large proportion of the foliage turns brown, and the plants are rendered thereby unsightly until May or June. For information as to their culture see under BAMBUS (p. 291). In no position is the beauty of hardy Bamboos more effectively shown than one near water—a position, too, which, in satisfying their great love of moisture, usually induces a most luxuriant growth.

Propagation.—This subject is dealt with fully elsewhere. We may, however, point out here that with rare exceptions all trees and shrubs are better on their own roots than when grafted or budded. Grafted plants may have an advantage at the start, but in the long run seedlings and own-rooted plants will overtake them. For instance, *Phillyrea decora*, grafted on the common Privet, succeeds well enough for two or three years, but after that time

it almost invariably becomes sickly. Evergreen Oaks grafted on deciduous ones, and all grafted Conifers, should be avoided. The fine garden varieties of Lilac are frequently grafted on the common form, with the result that, unless a continual look-out is maintained, the named variety ultimately disappears in a forest of suckers. Hardy garden varieties of Rhododendron are usually grafted upon *R. ponticum*, which proves a suitable stock if kept free from suckers, but if neglected in this respect the scions in time entirely disappear through the suckering of the stocks. In the case of trees, there is always a danger of the stems snapping off through faulty stocks or an imperfect union, which is often also the seat of cankerous, fungus-infested wounds. The safest method of grafting is to work the scion on the root of the stock; this usually prevents the formation of suckers, and has also the great advantage of allowing the scion to root on its own account.

The American Garden.—This term is usually applied to a piece of ground set apart for plants which enjoy a moist, peaty soil. Many of them are natives of North America, and they have come to be known collectively as “American plants”. In its geographical application the term is somewhat misleading, numerous shrubs belonging to this group being natives of Japan, Europe, and even of the British Isles. “American plants” are for the most part included under the two natural orders *Ericaceæ* and *Vacciniaceæ*, and some of the chief genera comprising the group are:—*Rhododendron*, *Azalea*, *Kalmia*, *Erica*, *Arbutus*, *Andromeda*, *Clethra*, *Pernettya*, *Vaccinium*, *Ledum*, *Gaultheria*, *Daboecia*, *Arctostaphylos*, *Pieris*, *Leucothoe*, *Lyonia*, *Zenobia*, *Menziesia*, &c. Their special value lies in their neat dwarf habit, the beauty and profusion of their flowers, and their rich green and mostly persistent foliage. A few, however, like the *Azaleas*, are deciduous.

American plants prefer a moist, cool soil, and generally they dislike lime, so that in many limestone districts it is useless to attempt to grow them unless in specially prepared soil. It is, however, interesting to note that some few of the Heath family thrive even better where it is present: *Rhododendron hirsutum* and *Rhododendron Chamæcistus* are cases in point. Several of the *Ericas*, too, thrive in chalky districts, such as *E. mediterranea* and *E. cinerea*. Where the natural soil is free from chalk the stronger-growing species may be used in shrubby borders. The soil most suitable is undoubtedly one of a peaty nature, but many of

them may be grown in a loamy soil, if free from chalk and of sufficient depth and body to retain moisture during long spells of dry weather. Rhododendrons, for instance, will sometimes grow in stiff loam.

Where the soil is of a clayey nature it should be trenched to a depth of at least two feet, and good leaf-soil—and, if practicable, peat—mixed with it so as to render it lighter and more open. Poor, sandy soils should be strengthened and made more retentive of moisture by adding stiff loam, leaf-soil, and peat, and the greater depth to which this is done the better, for the greatest drawback in cultivating “American plants” on such a soil is its hot, dry state during long spells of heat, which artificial waterings, however copious, can only partially remedy. On the other hand, stagnation at the root is as injurious as the other extreme. In chalky localities, where specially prepared soil has been provided, care should be taken that it is not so placed that water impregnated with lime from the surrounding land will drain into it. Rhododendrons and Azaleas are much benefited by an annual top-dressing of decayed cow-manure and leaf-soil in equal parts.

The best position for American plants is a sheltered hollow or ravine opening to the south or west. Such a position affords abundant scope for varied and informal arrangements, especially if a few other trees and shrubs are introduced, such as Magnolias, Acers, and the hardiest Bamboos.

ABELIA.—Dwarf branching shrubs with small opposite leaves, and tubular pink and white flowers. Allied to *Diervilla*, but less showy. Except in especially favoured localities they are not hardy. *A. floribunda* with rosy flowers, *A. rupestris*, and *A. triflora* with pink ones are sometimes grown on walls.

ACER.—Round-headed trees of moderate or large dimensions, with palmately-lobed leaves and inconspicuous flowers. The Common Maple and Sycamore are familiar examples. Many of the species have brilliantly-coloured foliage in autumn.

A. campestre, Common Maple.—A small tree with corky bark and five-lobed leaves. Will grow under the shade of other trees. Europe.

A. circinatum.—A medium-sized tree with roundish leaves, downy beneath, cut into about seven shallow lobes which acquire a bright-red tint in autumn. North-West America; introduced in 1826.

A. dasycarpum (*A. eriocarpum*), Silver Maple.—A very fine ornamental tree, 30 to 40 feet high. Leaves blue-white beneath. North America, 1725.

A. Ginnala.—A dwarf tree of graceful habit. Its prettily-lobed leaves turn a rich red in autumn. Amurland.

A. japonicum (fig. 345).—A shrub or small tree in the way of *A. circinatum*. Often confused with *A. palmatum*,

from which it is easily distinguished by its leaves having usually ten lobes, whereas in *A. palmatum* there are rarely more than seven. Japan.

A. macrophyllum.—A lofty-growing tree, 50 to 70 feet, with leaves nearly a foot in diameter. It is of very rapid growth, elegant in aspect, and quite hardy. North-West America, 1826.

A. monspessulanum, Montpellier Maple.—A low tree with small three-lobed leaves. In our climate it rarely grows beyond the size of a shrub. South Europe, 1739.

A. Negundo (*Negundo fraxinifolium*), Box Elder.—A small, very hardy tree, differing from the true Maples in having pinnate leaves. There is an extremely beautiful



Fig. 345.—*Acer japonicum*. (1.)

variegated variety of it, the foliage of which is almost white. It is one of the best variegated trees we have, and is often grown as a shrub. There is also a golden-variegated form, and a strong-growing variety from North-West America known as *californicum*. North America, 1688.

A. opulifolium var. *obtusatum*.—A handsome round-headed tree, 20 to 30 feet high, valuable for the profusion of tassel-like corymbs of greenish-yellow flowers it produces in March and April. Europe.

A. palmatum (*A. polymorphum*).—A small tree, sometimes 15 feet high. The many forms of it show great variety in shape, size, and variegation of the leaves. They are popularly known as Japanese Acers. In recent years they have been largely imported from Japan and planted in the milder parts of Britain. It is only in such places that they will succeed. Some of the varieties have foliage of a beautiful red colour, others are golden, and many are beautifully lobed and cut. The following may be recommended: *pinnatifidum*, *aureum*, *crispum*, *septemlobum*, *roseomarginatum*, *dissectum*, *sanguineum*, *purpureum*. Japan.

A. pictum (*A. latum*).—A handsome variable tree having a wide range in temperate Asia; it is usually seen

under the name of *A. colehicum*. The variety *rubrum* has the leaves tinged with bright red.

A. platanoides, Norway Maple.—A handsome hardy tree, 60 feet high, with foliage resembling the Plane. A rapid-growing and very handsome tree. There are several good varieties of it, including the Eagle's-claw or Hawk's-foot Maple, *A. platanoides laciniatum*, which is curious and interesting. *A. cucullatum* and *A. Lobelii*, the latter a handsome fastigate form, belong here; there is also a variety, *albo-variegatum*, with leaves variegated with white. Europe, 1683.

A. Pseudo-Platanus, Common Sycamore.—Europe and Central Asia. A valuable ornamental tree, 40 to 60 feet high, growing well near the sea. The varieties are numerous. *A. P. flavo-variegatum (lutescens)*, called the Cor-sorphone Plane, has the leaves elegantly variegated with yellow; *purpurascens* has the leaves rich purple beneath; and *erythrocarpum* has red keys.

A. rubrum, Red Maple.—A small tree with scarlet or crimson flowers and red keys, the extremities of the branches deeply tinged with red in early spring, very ornamental. North America, 1656.

A. saccharinum, Sugar Maple, or Bird's-eye Maple.—A tree from 30 to 80 feet high. North America, 1735.

ACTINIDIA polygama (Trochostigma polygamum).—A deciduous climber, with heart-shaped leaves on long slender stalks, and white fragrant flowers in summer, succeeded by edible berries. Japan, 1870.

ÆGLE sepiaria (Citrus trifoliata) (fig. 346).—A shrub, 6 feet or more high, armed with stiff spines. The leaves are trifoliate and have a winged petiole. Flowers white, produced in June. Fruit orange-yellow, about 1½ inch across. This is the hardest of the Orange tribe. Japan.

ÆSCULUS.—This genus includes some of the most ornamental of our large flowering trees, which are admirable either as isolated specimens or for forming avenues.

Æ. californica (fig. 347).—The handsomest of the North American species, 12 to 15 feet high; flowers white, very fragrant, produced in great profusion. 1857.

Æ. Hippocastanum, Horse-Chestnut.—There is a very fine double-flowered variety, and several others, none of the latter being superior to the type. Asia Minor, 1629.

Æ. macrostachya (Pavia macrostachya).—An elegant shrub, 4 to 6 feet high, with long racemes of white flowers having long projecting stamens, and produced in July and August, later than those of other species. North America, 1820.

Æ. Pavia (Pavia rubra), Red Buckeye.—A small slender tree, with small red flowers. Virginia, 1711. The variety *humilis* is of straggling shrubby habit, and *laciniata* has the leaves sharply toothed.

Æ. rubicunda (Æ. rubra coccinea), scarlet-flowered

Horse-Chestnut.—A handsome tree, believed to be of garden origin. There are several varieties, of which *Briotii* is the best.

AILANTUS glandulosa, Tree of Heaven.—A tall rapid-



Fig. 347.—*Aesculus californica*. (1.)

growing tree, with ample pinnate leaves, and inconspicuous flowers, which are heavy-scented, and said to have an unhealthy influence. It thrives well in sheltered localities near the sea, but young sappy shoots are often injured by frost in low situations. The food tree of the Japanese silkworm. It is propagated readily by means of root-cuttings. North China, 1751.

AKEBIA quinata.—A pretty twining plant, with smooth palmately-divided leaves on long stalks, the leaflets also stalked. Flowers small, violet-red, appearing in spring. Hardy only in the milder parts of the United Kingdom. Japan, 1845.

ALNUS.—The Alders, a genus of useful trees, especially for wet situations.

A. cordifolia.—A handsome tree, 30 to 50 feet high, noteworthy for its large heart-shaped lustrous leaves. It prefers a drier soil than *A. glutinosa*. South Europe, 1820.

A. firma (A. multinervis) (fig. 348).—A very distinct Alder, its leaves being long, sharply-toothed, and many-nerved. Japan.

A. glutinosa, Common Alder.—A useful quick-growing tree in wet places. Of its numerous varieties the best are: *aurea*, with golden leaves; *laciniata*, with a drooping habit and fern-like, deeply-cut foliage; *imperialis*, with even more handsomely-cut leaves; and *quercifolia*, with sinuate, Oak-like leaves.

A. incana.—Leaves broadly ovate and more or less downy beneath, 20 to 30 feet. North America.

A. nitida.—This has the largest leaves of all the Alders; they are often 5 to 6 inches long, and broad in proportion. A fine tree. Himalaya.

AMELANCHIER.—Shrubs or small trees with small oblong or oval leaves, and racemes of pure-white flowers, produced in great profusion in early spring. Fruit similar to that of the Hawthorn, black, purple, or red.



Fig. 346.—*Ægle sepiaria*. (1.)

Fig. 348.—*Alnus firma*. (H.)

A. alnifolia (*A. florida*) (fig. 349).—This flowers later than the others, and its habit is more erect. It differs also in the terminal part of the leaf only being toothed. North-West America.

Fig. 349.—*Amelanchier alnifolia*. (H.)

A. canadensis, June-berry, Shad-flower.—There are several varieties of this species, differing slightly in the form of the leaves, size of the flowers, and colour of the

fruit. The varieties named *ovalis*, *sanguinea*, *florida*, and *floribunda* belong here. North America, 1746.

A. vulgaris.—Similar to the last, differing mainly in the narrower sepals and petals. It also comes into bloom rather earlier. Europe, 1596.

AMORPHA.—A genus of leguminiferous plants with pinnate leaves and terminal spikes of flowers.

A. canescens, Lead Plant.—A shrub, 2 to 3 feet high, with dark purplish-blue flowers. Its leaves and stems are covered with a gray pubescence. Frequently killed to the ground in winter, but growing again freely the following spring. North America, 1812.

A. fruticosa, Bastard Indigo.—An elegant shrub, 6 to 9 feet high, with small dark-purple flowers remarkable in having only one petal developed in each. Flowers in June or July. Carolina, on the banks of rivers, 1724.

AMPELOPSIS.—These useful hardy climbers are now included by botanists in the genus *Vitis*, but for garden purposes we retain the present more familiar name.

A. bipinnata.—A beautiful hardy tendrilled climber with slender stems, growing from 10 to 20 feet high, and of comparatively slow growth. The leaves are bipinnately divided, with the leaflets cut at the edges; the inconspicuous greenish flowers are in short panicles. North America, 1700.

A. quinquefolia (*hederacea*), Virginian Creeper.—This rapid-growing climber, which quickly attains from 30 to 60 feet in length, is one of the most useful of plants for covering blank wall surfaces or fringing balconies; in exposed situations its brilliant crimson autumnal tints are most picturesque. Like the Vine, to which it is closely allied, its branches are furnished with tendrils, by means of which it climbs. The leaves usually consist of five oblong pointed toothed leaflets; flowers small, green, paniced, inconspicuous. There is a hairy-leaved variety, and a very useful one called *muralis* or *Englemanni* which has the power of clinging closely to a wall without support. North America, 1629.

A. tricuspidata (*A. Veitchii*, *A. Roylei*).—A beautiful rapid-growing slender deciduous climber, with short branched tendrils provided with suckers by means of which it holds fast to any surface with which it comes in contact, so that, once set agoing, no nails or shreds are required. In its juvenile stage it has simple cordate toothed leaves, lying closely over each other; but when mature its leaves are three-lobed, or divided to the base into three leaflets; the colour is a light tender green, flushed with red in summer, changing to brilliant crimson in autumn. It thrives well even in the smoke of towns. The flowers are, as in the other species, inconspicuous. Japan, 1864. Sometimes called *Vitis inconstans*.

AMYGDALUS.—According to the most recent botanical classification this genus, along with *Armeniaca* (the Apricot), *Persica* (the Peach), and *Cerasus* (the Cherry), are included under *Prunus*. We retain the older divisions as being more convenient for garden purposes. The Almond and some of the smaller allied species are amongst the earliest and loveliest of spring-flowering trees and shrubs. The flowers are produced when the trees themselves are leafless, so that their beauty is much enhanced if they are planted where there is a background of hollies or other evergreens.

A. communis, the Almond.—A small tree with showy flowers of various shades of rosy pink, and, in some flowers, white. *Amara* (Bitter Almond) has larger flowers, rosy only towards the centre; *dulcis* (Sweet Almond) has redder flowers than the common Almond. There are

also double-flowered varieties of different shades. South Europe, &c., 1538.

A. nana.—A dwarf shrub from 2 to 4 feet high, with rose-pink flowers appearing in March or April. There are several varieties. A dry warm soil suits them best. Southern Russia, 1683.

A. orientalis.—A taller growing species than *A. nana*, remarkable for the silvery tomentum of its foliage; flowers rose-coloured. March and April. Asia Minor, 1756.

ANDROMEDA.—A considerable number of shrubs, widely different in habit and flowers, are cultivated in gardens under the name of *Andromeda*, but following the most recent arrangement of the genera of the *Ericaceæ*, we have only one commonly-grown species to mention here. The others will be found under the genera *Cassandra*, *Cassiope*, *Leucothoe*, *Lyonia*, *Oxydendron*, *Pieris*, and *Zenobia*.

A. polifolia.—A dwarf indigenous evergreen shrub, with narrow shining leaves, glaucous beneath, and small globose white or pink flowers in terminal clusters, produced all the summer. It varies considerably in the shape of the leaves and size of the flowers, and names have been given to some of the more distinct American forms, as *rosmarinifolia*, *rubra*, *canadensis*, *angustifolia*, &c.

ARALIA.—Prickly shrubs of ornamental aspect, with tall, slender stems and very large much-divided leaves, and a branching inflorescence of small, yellowish or greenish-white flowers. Light moist soil.

A. chinensis (*Dimorphanthus mandshuricus*) (fig. 350).—An effective plant, with simple stems, very large bipinnate leaves, the stalks usually very prickly, and large



Fig. 350.—*Aralia chinensis*.

racemes of whitish flowers succeeded by black berries. Northern China, 1865.

A. Maximowiczii.—A distinct shrub with an erect prickly stem and palmate 5-7-lobed leaves. Japan, 1874.

A. spinosa, Angelica Tree.—A shrub with stout simple stems, and very large, tripinnate leaves. It has a distinct and noble appearance. Virginia, 1688.

ARBUTUS.—There are only three species of *Arbutus* that may be termed hardy in Britain, although numerous specific names have been given to hybrids and varieties of these. They are handsome small trees or shrubs with globular or bell-shaped flowers and thick, deep-green leaves. The bark of the stem peels off after the manner of the Plane-tree. In the colder parts of the country all the species except *A. Unedo* and its varieties need pro-

tection, and in any locality the most sheltered positions should be given them. They prefer a peaty soil and love abundant moisture.

A. Andraehne.—This has smooth shining leaves nearly as large as those of the common Laurel, erect panicles of greenish-white flowers, and a smooth scarlet fruit, rarely perfected in this country. Mediterranean region, 1724.

A. hybrida.—One of the earliest of the hybrid forms grown in gardens. It is intermediate in character between the preceding and *A. Unedo*, having drooping panicles of dull-white flowers, and is a very ornamental shrub, but rarely ripens its fruit.

A. Menziesii (*A. procera*).—This has large leaves and ample terminal panicles of greenish-white flowers, produced in April. It is not quite so hardy as *A. Unedo*, but is much more beautiful. North America, 1825.

A. Unedo, Strawberry Tree.—An exceedingly ornamental shrub or tree, especially when laden with its scarlet mucronated fruits. The flowers vary from white to red. It is a native of the south of Ireland, and has long been in cultivation.

ARCTOSTAPHYLOS alpinus.—A trailing deciduous shrub, with racemes of small pure white flowers, produced in May or June. Its black berries are rarely seen on cultivated plants. Requires a cool, airy, half-shaded situation. *A. Uva-ursi* is a freer-growing evergreen species, with red berries. Both are British.

ARISTOLOCHIA.—Twining shrubs, with large heart-shaped leaves, and curiously-shaped, usually dull-coloured flowers. Besides the species mentioned below, there are several others in cultivation, but all the hardy or half-hardy ones are more curious than beautiful.

A. Sipho, Dutchman's Pipe.—This is worth growing for its ample ornamental heart-shaped foliage. The tubular curved flowers are constricted at the mouth and have a spreading three-lobed limb, their colour being dull-yellow streaked with purple; they appear in May or June, but being of a dull colour, and produced in the axils of the leaves, they are easily overlooked. North America, 1763. Succeeds best in a light soil and warm situation.

A. tomentosa.—Similar to *A. Sipho* in habit, but the flowers are purple and yellow and much more deeply lobed. Leaves downy beneath. North America.

ARISTOTELIA Macqui.—A shrub growing to a height of 10 feet or more. It has simple three-nerved leaves, and small axillary purple and yellow flowers, succeeded by dark-purple berries. Chili, 1733. Too tender for the colder parts of the kingdom, and usually requiring a wall. There is a handsome variety with variegated leaves.

ARTEMISIA Abrotanum, Southernwood. This familiar shrub has its fragrant foliage finely divided into narrow segments. The small yellowish flowers are not very ornamental. Widely distributed in Europe and Asia, 1596. The variety *tobolskiana* is larger in all its parts than the common form.

ARUNDINARIA. A genus of Bamboos, distinguished from *Phyllostachys* by their straight, terete stems, semi-verticillate branching, and by the branches developing either simultaneously up the stem or from the top downwards. It includes some of the most beautiful and graceful of hardy Bamboos. For culture see *BAMBUSA*.

A. anceps.—Stems slender, erect, about 8 feet high, bearing abundant deep-green leaves. A perfectly hardy species, which spreads rapidly by means of its rhizomes. N. India.

A. auricoma (*Bambusa Fortunei aurea*).—Stems 3 to 4 feet high; leaves about 6 inches long, handsomely striped with yellow. Japan.

A. Falconeri (*Thamnocalamus Falconeri*).—Frequently grown as *A. falcata*. In the gardens of Cornwall, South Ireland, &c., it is a most beautiful plant, sending up graceful arching stems 24 feet long, clothed with bright-green foliage. In the midlands it is killed to the ground nearly ever winter. North India.

A. Fortunei. Stems tufted, 2 to 3 feet high; leaves handsomely striped with white, quite hardy. Japan.

A. Hindsii (*Bambusa erecta*).—Stems erect, 10 feet high, with long dark-green narrow leaves. A variety called *graminea* is about 5 feet high, and the stems are yellowish. Japan.

A. japonica (*Bambusa Metake*).—Stems 8 to 12 feet high, with larger leaves than any other hardy species of that height. A well-known and very hardy Bamboo. Japan, 1850.

A. macroperma.—This is the sole representative of the Bamboo family found in the United States and Canada. In the Southern States it forms the dense thickets near the banks of rivers, &c., known as "Cane-brakes". Here it grows about 5 feet high.

A. nitida.—Stems slender, 8 to 10 feet high, which become dark-purple; leaves 3 inches long, $\frac{1}{2}$ inch wide, and of a rich vivid green. One of the most elegant and attractive of all Bamboos. China, 1891.

A. nobilis.—Nearly allied to *A. Falconeri*, but differs in the stems, which are stained with purplish-brown near the nodes. Stems 24 feet long in Cornwall. It is hardier than *A. Falconeri*, but is frequently killed to the ground in the Midlands. North India or China.

A. Simoni.—The tallest of the truly hardy Bamboos, its stems reaching a height of about 20 feet. Its leaves are 8 to 12 inches long by 1 inch wide. A rapidly-spreading plant which should have an isolated position. Japan, 1862.

A. Veitchii.—Stems 1 to 2 feet high, with narrowly oblong leaves, which are dark-green in summer but turn white at the margins in autumn and winter. A dwarf rapidly-spreading plant. Japan, 1889.

AUCUBA.—The familiar mottled-leaved variety of *A. japonica* was introduced to this country from Japan as long ago as 1783, and is the female form. The male or pollen-bearing form was introduced from the same country by Mr. Fortune in 1850. The varieties of both are now exceedingly numerous, and large specimens of the green-leaved sorts, as well as of the old variegated form, laden with their large scarlet oblong berries, are not rare. If exposed to strong winds the young wood of this shrub is very liable to be destroyed.

It succeeds well in town gardens. The following are varieties distinguished by nurserymen. Male:—*picta*, *bicolor*, *sulphurea*, and *ovata*, with variegated foliage; *vera* and *grandis*, with green foliage. Female:—*sulphurea*, *latimaculata*, and *aurea marginata*, with variegated foliage; *longifolia*, *vera*, and *angustifolia*, with green foliage. The variety *luteocarpa* bears yellowish berries.

AZALEA.—Although most botanists now unite the species referred here with *Rhododendron*, it is more convenient for horticultural purposes to keep them separate, especially as there is no difficulty in distinguishing the commonly-cultivated species of both sections. The typical species are rarely seen in cultivation, having been superseded by improved garden varieties. These hardy flowering shrubs are so beautiful, affording as they do a great variety of colour combined with the most delicious perfume, that their value in gardens can scarcely be over-estimated; they represent almost every shade of scarlet, crimson, orange, yellow, pink, and white, while in some

there is a combination of these colours. The following are the principal species from which the varieties in cultivation have been raised.

A. arborescens.—A bush, 10 to 15 feet high, flowers in which the corolla tube is longer than the lobes, differing in this respect from all the rest. North America, 1818.

A. calendulacea.—A shrub, from 3 to 6 feet high, with handsome hairy, not clammy, red or yellow flowers. Even in the wild state this is a very variable plant. North America, 1806.

A. indica var. *amena*.—In the neighbourhood of London and farther south this well-known greenhouse plant makes a charming hardy evergreen.

A. ledifolia (*A. indica alba*).—In the warmer parts of these islands this is a useful evergreen, and also one of the most beautiful of early summer flowering shrubs. It forms a compact low bush, and produces numerous pure-white flowers like those of the true Indian Azalea. Perfectly hardy at Kew, and largely grown in some parts of Ireland and Cornwall. Japan, China.

A. mollis (*sinensis*) (fig. 351).—A fine showy species from Japan, of which there are now many varieties. Although known best as a pot plant, and grown largely



Fig. 351.—*Azalea mollis*.

for early forcing, it is as hardy as any of its allies, and is a most useful shrub for the open garden. It has been crossed with the Ghent Azaleas and *A. occidentalis*.

A. nudiflora.—Similar to *A. calendulacea*, but with rather naked flowers, in wild varieties usually of some shade of pink or purple. North America, 1734.

A. occidentalis.—The latest flowering Azalea (June and July). Flowers white and very fragrant; the plants are in full leaf before they fade. California. A handsome, vigorous shrub.

A. pontica (*flava*).—This species grows about 6 feet high, and has pale-yellow clammy flowers in the original variety. Asia Minor, 1793.

A. rhombicum.—A distinct early-flowering shrub, often being in full beauty during early April. The leaves are

rhomboidal, dull-green and hairy. Flowers bright rosy-purple, 2 inches across. Japan.

A. Vaseyi.—A species introduced from North America in 1888. Leaves 2 to 3 inches long, lanceolate, pointed. Flowers nearly 2 inches across, very pale rose on first opening, afterwards almost white. It blossoms when only a few inches high.

A. viscosa.—A shrub from 3 to 4 feet high, the flowers of which are variable in colour, very viscous, with the tube of the corolla as long as the lobes. North America, 1734.

AZARA.—There are several species of this genus of South American evergreens in cultivation, but they require protection in central and eastern Britain. They have simple leaves, the alternate ones often smaller, and some have rather showy flowers.

A. dentata.—A bushy shrub with glossy bright-green leaves, hairy beneath. It succeeds against a south wall. Chili, 1830.

A. Gilliesii.—A handsome species with coriaceous, smooth, dark-green leaves, on red petioles; flowers yellow in dense axillary racemes. Chili, 1850.

A. microphylla.—Although tender, this is a most desirable shrub where it will succeed. It has small, shining, dark-green leaves and is of graceful habit. The flowers are small, greenish, with a strong Vanilla-like odour. There is a specimen at Belvoir Castle 16 feet high. Chiloe, 1872.

BACCHARIS *halimifolia*, Groundsel Tree.—A branching shrub, from 6 to 10 feet high, with angular branches, small grayish-green leaves, and small yellow flower-heads, appearing in autumn. Valuable mainly for planting near the sea. North America, 1683.

BAMBUSA.—Under this generic name the whole of the hardy Bamboos now in cultivation are popularly known. Except the following they all belong to either *Arundinaria* or *Phyllostachys*, which see. The cultivation of hardy Bamboos is very simple. They are not particular as to soil, but prefer a good loam enriched by manure. They are moisture-loving plants, and are frequently planted with good effect near water. The dry, cutting east winds so common in spring are more injurious to them than many degrees of frost; they should therefore be planted, if possible, where there is shelter to the north and east. All replanting, division for purposes of propagation, and similar operations should be done in May; autumn and winter are the worst seasons for this work. An annual top-dressing of rich manure is most beneficial.

B. fastuosa.—Stems 12 to 15 feet high, short-jointed; leaves 5 to 7 inches long and an inch wide, bright-green above, very glaucous beneath. Japan, 1894.

B. Metake.—See *Arundinaria japonica*.

B. palmata.—A strikingly handsome evergreen. Stems 4 to 6 feet high; leaves over 1 foot long and 4 inches wide. Japan.

B. pumila.—Stems thin, erect, about 2 feet high; leaves 4 inches long, covered with minute hairs. Japan, 1888.

B. pygmaea.—A small dense grower with stems from 4 to 12 inches high. It is useful for forming a green carpet, as it spreads with great rapidity. Japan, 1888.

B. quadrangularis.—A remarkable species with square stems 4 to 6 feet high. Most suitable for the south-west. Japan.

B. tessellata (*B. Ragamoniki*).—Although a plant of dwarf stature, under 3 feet in height, this has larger leaves than any other hardy Bamboo, some measuring over 1½ foot in length by 4 inches in width. China and Japan.

BERBERIDOPSIS *corallina* (fig. 352).—A very ornamental climbing shrub, with simple oblong spiny leaves,

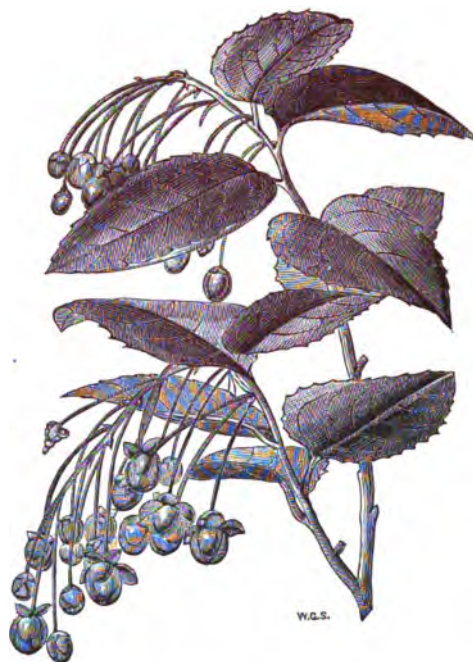


Fig. 352.—*Berberidopsis corallina*.

resembling those of a *Berberis*, and terminal drooping racemes of crimson flowers. If protected from severe frost it may be grown on a sheltered south wall; it is



Fig. 353.—*Berberis aristata*. (4.)

especially suitable for the south-west of England and Ireland. Chili, 1862.

BERBERIS.—Some of the showiest of our spring- and summer-flowering shrubs belong to this genus. All the species have flowers of some shade of yellow, but they vary in being deciduous or evergreen, and in stature range

from prostrate plants scarcely 2 feet high to shrubs 20 feet in height. They are mostly spiny or have prickly leaves, the latter in the section *Mahonia* being pinnate



Fig. 354.—*Berberis congestiflora*. (1.)

and evergreen. Most of the following species will thrive in any fairly rich open soil, but some of the weaker ones are benefited by the addition of peat. Propagation is effected by seeds and layers.

B. Aquifolium.—This grows to a height of 6 or 8 feet, and bears a profusion of yellow flowers in April and May. North-Western America, 1823. *B. repens* is a dwarf form of this. The glossy foliage changes to a reddish-purple colour in winter. Invaluable for planting under the shade of trees. Both are evergreen.

B. aristata (fig. 353).—In foliage this strongly resembles the common Berberry. It is erect in habit, with furrowed, reddish-brown branches; the flowers, in pendulous cymes, appearing in May. The purplish glaucous berries are rather large in this species. Northern India, 1820.

B. buxifolia (*B. dulcis*).—An erect slender species, nearly evergreen, 5 or 6 feet high. The flowers are large for the genus, and solitary, on long slender stalks, produced all through the spring. Berries bluish-black. Magellan, 1828.

B. congestiflora (fig. 354).—A bush, 6 to 8 feet high, leaves 1 to 2 inches long, almost imbricated, roundish oblong; flowers in compact, globose heads, golden-yellow. A very beautiful but rare Berberry, introduced from Chili in 1861.

B. Darwinii.—This is certainly one of the most ornamental shrubs in cultivation, but it is sometimes cut by frost. It forms a densely branching sub-erect evergreen bush, with small, blunt, glossy, dark-green, prickly leaves, and orange-yellow flowers appearing in early spring, and sometimes again in autumn. Patagonia, 1847.

B. empetrifolia.—An evergreen from 1 to 2 feet high; leaves linear, revolute, and sharp-pointed; flowers in terminal umbels, produced from December to March. Chili, 1830.

B. fascicularis.—A very elegant evergreen, allied to *B. Aquifolium*. It is remarkable for its glaucous-green colour; rather tender in the climate of London. It makes a fine wall plant. Mexico, 1819.

B. Fortunei (*Mahonia*).—This species has few distant lanceolate leaflets, and terminal spikes of yellow flowers. China, 1846.

B. glumacea (*B. nervosa*).—An evergreen dwarf slow-growing species; leaflets narrow; flowers yellow, in terminal elongated racemes 6 to 8 inches long, produced in spring. North-West America, 1822.

B. ilicifolia.—This is a very handsome species, with smallish holly-like leaves, and orange-yellow flowers tinged with red. Introduced from the extreme south of America about 1843.

B. japonica.—An evergreen with large leaves of a yellowish-green tint, composed of broad spiny leaflets of irregular outline, and terminal clusters of yellow flowers, produced in winter or early spring. *B. Bealii* is a seedling form of it. They are so distinct from everything else that one or the other of the varieties deserves a sheltered and somewhat shaded place on a well-drained or peaty soil, or a little wall space in every garden. Japan, 1845.

B. nepalensis.—A remarkably handsome but tender plant of erect habit, 8 to 10 feet high, with pinnate leaves composed of numerous thickly-set lanceolate spiny leaflets, of a glaucous-green colour, and a cluster of erect terminal spikes of yellow flowers. Probably a form of *B. japonica*, but is of a paler green, and has quite differently-formed narrow leaflets, whence it has been called the Ash-leaved Berberry. Nepal, 1850.

B. stenophylla.—A hybrid raised from *B. Darwinii* and *B. empetrifolia* and the most ornamental of the evergreen Berberries. It is of elegant habit, its slender interlacing



Fig. 355.—*Betula alba* Youngii.

branches forming a dense thicket. The leaves are narrow and pointed, and the flowers a rich yellow. If seeds be sown, a portion of the seedlings will revert to *B. Darwinii*,

others to *B. empetrifolia*. Flowers in spring; 8 to 10 feet high.

B. Thunbergii.—A dwarf shrub, very effective when planted in a mass by reason of the beautiful red of the leaves in autumn. Japan, 1883.

B. vulgaris, Berberry.—A handsome British shrub, producing its pendent racemes in spring. The fruit is very handsome, and there are varieties with scarlet, purple, yellow, and white fruits. A form with purple leaves is effective when planted in a group.

B. Wallichiana.—A very useful evergreen of close tufted growth varying from 2 to 4 feet high. The leaves are of the deepest green and in one form glaucous beneath. Himalaya, 1820.

BETULA.—The Birches are picturesque and graceful trees, especially the weeping forms.

B. alba, Birch.—One of the most beautiful of our forest trees, and always effective in the garden. The varieties *pendula* and *Youngii* (fig. 355) are two of the best of weeping trees; *laciniata* has deeply cut leaves.

B. papyracea, Paper Birch.—A North American species introduced in 1750; of larger size than the preceding, but not otherwise superior. In Canada the bark is employed for making canoes.

The following species may also be mentioned as worth growing:—*B. lutea* (Yellow Birch); *B. nigra* (Black Birch); *B. nana*.

B. Maximowiczii is a recent and very promising introduction from Japan; it is quite hardy and grows rapidly. Its leaves are larger than those of any other Birch.

BIGNONIA capreolata.—A climbing shrub, with conjugate leaves terminating in a tendril, and numerous large axillary reddish-yellow flowers, appearing in June and July. Very ornamental against a wall with a sunny aspect. North America, 1710.

BROUSSONETIA papyrifera, Paper Mulberry.—A small tree resembling the common Mulberry, but its flowers are dioecious, and the males grow in cylindrical drooping catkins. Japan, 1751. The shape of the leaves varies in different forms, often even on the same plant.

BRYANTHUS empetrifolius (fig. 356).—A charming Heath-like evergreen shrub about a foot high, with broad bell-shaped reddish-purple flowers. North America, 1829. *B. erectus* is believed to be a hybrid between this species and *Rhododhamnus Chamaecistus*.

BUDDLEIA.—These are evergreen shrubs in their native country, and in mild winters are so with us; but as they usually shed their foliage, more or less, according to the severity of the weather, they should not be planted where evergreens are desired.

B. Colvillei.—The most beautiful of all Buddleias, but unfortunately only hardy in the south and southwest. The flowers are 1 inch long, rose-purple or crimson, and produced in panicles 12 to 18 inches long. Himalaya.

B. globosa.—The leaves of this species are clothed with a silvery tomentum beneath. The flowers are honey-scented, orange, in small globular heads, appearing in summer. It grows about 10 or 12 feet high, and succeeds well against a wall, or near the sea where it is not too bleak. It is sometimes killed down to the crown of the

stem by hard frosts, but springs up again luxuriantly. Chili, 1774.

B. variabilis.—An ornamental shrub, very different from the preceding, having racemes of lilac or rosy-purple flowers more than 1 foot long. The leaves are long and narrow. There is a prostrate form, and a more erect one. China, 1893.

BUPLURUM fruticosum.—A branching sub-evergreen shrub about 6 feet high, with simple coriaceous glaucous leaves, and yellowish umbellate flowers, the umbels on long stalks; the flowers appear in July or August. It succeeds well near the sea, and in warm situations on a dry soil. Southern Europe, 1596.

BUXUS.—The common Box is one of our most useful evergreens, and some of the smaller-leaved and pendulous varieties make very elegant small trees.

B. balearica.—This is a fine species, with thick coriaceous leaves nearly 2 inches in length. It is faster-growing and larger than the common Box. Minorca, 1780.

B. sempervirens, Common Box.—The varieties of this are numerous, from the dwarf form used for edging (var. *suffruticosa*) to the arborescent variety. *Myrtifolia* is a robust form with relatively large leaves; *rosmarinifolia* is a compact dwarf bush with slender branches and narrow leaves; *angustifolia* has very narrow leaves; and *rotundifolia* small roundish leaves. The several gold and silver striped varieties are also ornamental.

CÆSALPINIA japonica.—A shrub of spreading habit, the stems of which are thickly set with curved spines. The leaves are bipinnate, bright-green, and the flowers, which are produced in erect racemes, are bright canary-yellow with red anthers. Deciduous. Japan.

CALOPHACA vulgarica.—A dwarf branching shrub about 3 or 4 feet high, with small unequally pinnate leaves, bearing a profusion of yellow papilionaceous flowers in June, succeeded by reddish pods. It is quite hardy, and forms a very pretty object when grafted as a standard on the stem of the Laburnum. Siberia, 1780.

CALYCANTHUS.—Large or small aromatic shrubs, with simple leaves and solitary axillary rosette-shaped fragrant flowers of a lurid red or brown colour.

C. floridus, Carolina Allspice.—A compact bush 6 to 8 feet high, producing its dusky flowers in great abundance from May to July. There are several varieties in cultivation, including the following:—*asplenifolius*, with cut leaves; *bullatus*, with bladdery leaves; and *variegatus*, with variegated leaves. Carolina, 1726.

C. occidentalis.—This is a much larger growing species, with large ovate-cordate leaves, and larger brighter-coloured flowers. It prefers a warm sunny situation, for, although hardy, it does not flower freely in a shrubbery. The variety called *macrophyllus* in nurseries belongs to this species. North America, 1831.

CAMELLIA. The merits of some of the varieties of *C. japonica* as hardy evergreens have not yet been fully recognized. If given shelter from north and east winds they are quite hardy, and when once established flower charmingly. They like a peaty soil and plenty of moisture. The single varieties are preferable to the double ones, and the red to the white. The old variety *Donckelaeri* is a good one for out-of-doors.

CARAGANA.—Very hardy shrubs or small trees, often spiny, with abruptly-pinnate leaves and abundant yellow papilionaceous flowers. Often grafted standard high on the Laburnum, or on *C. arborescens*.

C. Allagana (*C. microphylla*).—A dwarf spiny bush 2 to 4 feet high, flowering from May to July. The



Fig. 356.—*Bryanthus empetrifolius*. (S.)

flowers of this species are rather large, and usually solitary in the axils of the leaves. Siberia, 1789.

C. arborescens.—A tall shrub or small tree from 10 to 20 feet high. The wood is peculiarly hard and tough. Siberia, 1752. Variety *pendula* is a handsome weeping tree, and the variety *Redowski* is distinct in its long serpentine branches.

C. Chamagru.—A spreading shrub 2 to 4 feet high; flowers yellow, changing to a reddish hue; the leaf consisting of four leaflets. Northern China, 1773.

C. frutescens.—A more robust growing species than the last, 8 to 10 feet high. This is very ornamental when worked as a standard on *C. arborescens*. Siberia, 1752.

C. pygmaea.—A dwarf spreading species, with smaller flowers, the stems bearing trifid spines. Altai Mountains, 1751. The variety *aurantiaca* is the best of the dwarf Caraganas; flowers orange-yellow.

CARPINUS Betulus, Hornbeam.—This native tree resembles the Beech, but it does not grow to so large a size, rarely exceeding 30 or 40 feet, and it has oblique rough leaves. It bears clipping well, and is frequently used for forming dense hedges. Of several varieties now in cultivation the best are the golden variegated and the oak-leaved *quercifolia*.

CARYA.—The Hickories are an exclusively North American genus of trees, with pinnate leaves and inconspicuous flowers. They are closely allied to the Walnuts, but the husk of the fruit splits into four regular valves. These elegant trees deserve to be more generally grown than they have been hitherto. They should be planted young, as they are impatient of removal. There are a dozen species, the following being the hardiest:—

C. alba, Shell-bark Hickory.—A handsome tree 80 feet high, with leaves about 18 inches long. 1629.

C. amara, Bitter Nut or Swamp Hickory.—A fine tree about 50 feet high, introduced in 1800.

C. oliviformis, Pecan Nut.—Similar to the last, but the fruits are described as delicious. 1766.

C. tomentosa.—This is a magnificent foliage-tree, the divisions of its leaves being larger than in any other *Carya*.

CASSANDRA calyculata.—A dwarf branching evergreen shrub, with small oblong leaves, reddish-brown beneath, and small, though elegant, white flowers, produced from February till the end of spring. Widely dispersed in the northern hemisphere, and cultivated in this country since 1748. The variety *major* has larger flowers.

CASSIOPE tetragona (fig. 357).—A pretty little evergreen 6 to 9 inches high, having small, dark-green, closely imbricated leaves in four ranks, and terminal, globular, pendulous white flowers in March or April. It should be sheltered in winter, especially if the weather be very changeable, for although quite hardy it will succumb to frequent freezing and thawing. This remark applies to many other small-growing subjects of this class. Lapland, &c., 1810.

CASTANEA vulgaris (*C. sativa*), Sweet Chestnut.—This is one of the largest and most stately of our hardy deciduous trees. It is supposed to have come originally from Asia

Minor. There are several varieties, one of the best being *aureo-variegata*, with golden-edged foliage.

CASTANOPSIS chrysophylla.—A shrub or small tree allied to the Sweet Chestnut. The leaves are ovate-lanceolate, dark-green above, tawny-yellow beneath. North-West America, 1848.

CATALPA bignonioides (*C. syriacifolia*), Indian Bean.—A handsome small tree with large heart-shaped leaves, and terminal panicles of white flowers, tinged with violet and speckled with purple and yellow, produced in summer. There is a striking variety, *aurea*, with handsome golden foliage. Southern States of North America, 1726. *C. cordifolia* (*C. speciosa*) has larger panicles and larger flowers. It is also from North America, but has a more western distribution. *C. Bungei* is a native of China, and *C. Kampferi* is from Japan.

CEANOTHEUS.—Very ornamental North American shrubs, suitable for the south or west or for covering walls, but too tender, with the exception of the first, to stand out in the open in other parts of the kingdom. Flowers small, but numerous and showy, produced in panicles during the summer.

C. americanus, New Jersey Tea.—A dwarf species 2 to 3 feet high, with oblong three-nerved leaves, woolly beneath. Flowers white, in dense terminal clusters, produced in summer. Introduced in 1713.

C. azureus.—This species grows from 5 to 10 feet high, and has larger leaves than any of the other blue-flowered kinds. There are several varieties of it, the hardiest and most useful of which is *Gloire de Versailles*, which has larger panicles, and flowers of a deeper hue. Mexico, 1818.

C. Veitchianus.—A very ornamental species, with small glabrous leaves, and numerous dense clusters of bright-blue flowers. A native of California, as also are *C. Lobbianus* and *C. floribundus*, two closely-allied species. *C. dentatus*, *C. thyrsiflorus*, *C. rigidus*, and *C. papillosus* have also flowers of some shade of blue, and are exceedingly ornamental, well adapted for covering walls.

CEDELEA sinensis.—A handsome deciduous tree with pinnate leaves. It grows 20 to 30 feet high. China.

CELASTRUS scandens.—This is a free-growing climber, with ovate, serrated leaves and terminal racemes of yellowish flowers. The fruits become deep-yellow in autumn. It is useful for covering arbours, &c. North America, 1736. *C. articulatus* is an equally vigorous and beautiful climber when in fruit. Japan.

CELTIS.—Moderately large trees of pleasing habit. Leaves small, strongly nerved; flowers small, greenish. Allied to the Elms.

C. australis, Nettle Tree or Tree Lotus.—About 30 feet high. South Europe, 1796.

C. occidentalis.—An exceedingly variable North American species, including the forms grown under the following names:—*crassifolia*, *pumila*, and *Audibertiana*.

CERASUS.—Shrubs or small trees including both deciduous and evergreen species, now reduced to a section of *Prunus*. The deciduous species are amongst the most beautiful of spring-flowering trees. The evergreen species are commonly called Laurels. The Alexandrian Laurel is, however, *Ruscus racemosus* and the Greek, or Victor's Laurel, *Laurus nobilis*. The Double-flowered Cherry, *C. vulgaris flore pleno*, is an extremely attractive tree when laden with its pure-white blossoms in May. *C. Mahaleb*, a species much used for stocks, has fragrant flowers and is of elegant habit. *C. acida* var. *semperefflorens* is remarkable for its long flowering season, from May onwards; it is a small round-headed tree, and very



Fig. 357.—*Cassiope tetragona*. (L.)

ornamental as a single specimen; usually grafted or budded on stems of the common Cherry; native country uncertain. Other species deserving of separate mention are:—

C. Chamæcerasus.—A dwarf spreading shrub 3 or 4 feet high, producing an abundance of white flowers in May. Very pretty as a standard on the common Cherry. Central Europe and Siberia, 1587.

C. japonica (*Prunus chinensis*).—A slender shrub 2 to 4 feet high, with pink and white flowers; suitable for a wall. There is a handsome double-flowered variety named *multiplex*.

C. Laurocerasus, Common Laurel or Cherry Laurel.—This favourite shrub should not be planted for a hedge where a permanent screen is desired, as in very severe winters it is liable to be cut down to the ground. There are several varieties; among the large-leaved ones *caucasica* is at the same time the hardiest and the handsomest; it has rich dark-green foliage, broadest above the middle. The variety *colchica* is of more spreading habit, with narrower serrated leaves; *rotundifolia* has nearly orbicular leaves. A French variety known as the Versailles Laurel has leaves of immense size. Asia Minor, &c., 1629.

C. lusitanica, Portugal Laurel.—This is much harder than the Common Laurel, with darker-green, smaller and more pointed leaves, and is one of the most valuable evergreens we possess. There is a variety with smaller leaves and denser habit, called *myrtifolia*; another with large leaves called *azorica*. Portugal, &c., 1648.

C. Padus, Bird-Cherry.—An indigenous tree 20 to 30 feet high. It bears in May long racemes of white flowers, which are very ornamental but of short duration. A double-flowered variety is much superior. *C. virginiana* is a similar tree, of more slender habit.

C. Pseudocerasus.—A small tree 10 feet or more high, flowering in April and May, flowers single or double, white or rosy pink. China, 1819. There are numerous forms of this beautiful Cherry. *Watereri* is one of the best. Some new single forms have recently been introduced from Japan.

C. serrulata.—A beautiful species with semi-double white or rosy flowers produced in April. Its leaves are obovate, pointed, and serrate. It can usually be distinguished by its curious growth, the main stem of the tree being erect for about 4 or 6 feet, and then separating into three or four branches that take almost horizontal directions. China, 1822.

CEROIS.—Small irregularly branching trees, with heart-shaped or kidney-shaped leaves, and clustered reddish-purple, rose, or white flowers.

C. canadensis.—A smaller tree than the last, with more pointed leaves, and fewer pale-rose flowers. North America, 1730.

C. chinensis (*C. japonica*).—In foliage this resembles

the last, but the rosy-pink flowers are larger, very abundant, and produced all along the branches in spring before the appearance of the leaves.

C. Siliquastrum, Judas-tree.—About 20 feet high; flowers rosy purple, produced in spring before the leaves



Fig. 359.—*Chimonanthus retusus*. (4.)

are fully developed. There is also a white-flowered variety. Western Asia, 1596.

CHIMONANTHUS fragrans (*C. praecox*) (fig. 358).—A slender branching shrub with lanceolate leaves, and fragrant yellow and purple rosette flowers an inch across, appearing in winter before the leaves unfold. A very desirable shrub for a wall, or sheltered place in the south. The variety *grandiflora* has larger, brighter flowers though not so fragrant. Japan, 1776.

CHIMONANTHUS retusus (fig. 359).—A shrub 5 to 6 feet high, leaf long-stalked, retuse, woolly beneath. Flowers white and fragrant. China and Japan, 1850.

C. virginica, Fringe-tree.—A large shrub or small tree, with simple leaves, and drooping clusters of pure-white flowers, having narrow fringe-like petals, and succeeded by purple drupes. Will flourish in a moist sandy peat or loam. North America, 1796.

CHOISTA ternata (fig. 360).—An evergreen shrub allied to the Rue. It has glossy green ternate leaves and charmingly scented Orange-like white flowers. It is hardy, but likes shelter. Mexico, 1825.

CISTUS.—A genus of many species chiefly from the Mediterranean region, and only suitable for dry, warm situations, and for the south and west coasts. They have undivided, often glutinous leaves, and large showy, though evanescent flowers. They deserve to be more generally planted on the sea-coasts named. They do not bear transplanting very well and therefore should be grown in pots in the nursery. The following are some of the hardier species.

C. cypricus.—This grows about 5 or 6 feet high, and is very near the true Gum Cistus, but it has large, solitary flowers, and stalked leaves. The petals are white with a purple blotch at the base. Cyprus, 1800.



Fig. 358.—*Chimonanthus fragrans*. (4.)

C. incanus.—This has very hoary wrinkled leaves, and reddish-purple flowers in June or July. About 3 or 4 feet high. South Europe, 1597.



Fig. 360.—*Choisya ternata*.

C. ladaniferus, Gum Cistus (fig. 361).—Resembles *C. cyprius*, but the leaves are not stalked; flowers borne in clusters of three or four. Spain and Portugal, 1629.

C. laurifolius.—This is the hardiest of all, and is remarkable for its strongly three-nerved leaves, densely woolly beneath, and white spotted flowers. An evergreen 5 feet high. South of France, 1771.

C. populifolius.—A distinct species, of large growth, with heart-shaped or oval wrinkled leaves on long stalks, and white flowers tinged with yellow in the centre. France, &c., 1656.

C. purpureus.—From 3 to 4 feet high; leaves oblong-lanceolate wrinkled; flowers reddish-purple, with a dark blotch near the base of each petal. Levant, 1659.

CLADRASTIS.—Small trees, with unequally pinnate leaves, and showy white or yellow pea-shaped flowers.

C. amurensis (*Maackia amurensis*).—A shrub 8 feet high, with long, erect racemes of small, densely-packed, greenish-white flowers. Amoor Valley, 1878.

C. tinctoria (*Virgilia lutea*), Yellow-wood.—A round-headed tree 20 to 30 feet high. Flowers white, borne in drooping racemes during May. North America, 1812.

CLEMATIS.—Owing to the rapidity of its growth, and the variety, size, and brilliancy of its flowers, this genus is especially valuable in the garden. The simple, ternate, or pinnate leaves, the stalks of which twine round other plants, are ornamental. The flowers are white, blue, red, or yellow. Almost all of them thrive well on a chalky soil, and flower in summer. The garden varieties are specially dealt with elsewhere.

C. alpina (*Atragene alpina*).—3 to 4 feet high, with solitary violet-blue flowers on long stalks, appearing in

May or June. *C. sibirica* is a variety with yellowish-white flowers. South Europe, &c., 1792.

C. Flammula.—This is one of the most ornamental of the genus for covering trellises, arbours, walls, &c. It has pinnate dark-green leaves, and white fragrant flowers, produced in great profusion from July till October. South Europe, &c.

C. florida.—This was the first introduced of the large-flowered Japanese species. There are both single and double white-flowered varieties. *C. Sieboldii* has flowers with a purple-violet centre.

C. Fortunei.—Leaves thick; flowers large, white, double, fragrant, about 6 inches across, and consisting of about 100 sepals. Japan, 1863.

C. lanuginosa.—This has large, usually simple heart-shaped leaves, hairy beneath, and very large and handsome pale-blue or lilac flowers 9 inches in diameter. China, 1851.

C. montana.—A highly ornamental species, with white flowers of medium size produced in mild seasons in April. North India.

C. patens (*C. azurea*).—A Japanese species, introduced in 1836, having bluish-lilac flowers 5 to 6 inches across, produced about May and June. It is one of the parents of numerous garden hybrids.

C. Viorna.—This has different flowers from any of the preceding. They are pendulous, tubular, and inflated, the sepals curled backwards at the top, of a leathery consistence, and yellowish-white tinged with purple. North America, 1730.

C. Vitalba, Old Man's Beard or Lady's Bower.—A useful quick-growing climber, suitable for covering unsightly objects. It has small, greenish-white, fragrant flowers, fol-

lowed by ornamental feathery carpels, which are attractive in winter. British.

C. Viticella.—One of the parents of many of the hybrid varieties raised. Flowers purple, blue, violet, or rose, of medium size, appearing all through the summer. South Europe, 1569.

CLERODENDRON *fatidum* (*C. Bungei*).—A species that will succeed in most parts of the kingdom; and although cut down to the ground by severe frost it usually survives and grows up again in summer, and is an ornamental autumn-flowering shrub. It is armed with a few scattered spines, has large cordate leaves, and large terminal corymbs of lilac-rose flowers. 1820.



Fig. 361.—*Cistus ladaniferus*.

C. trichotomum.—The hardiest and best of the Clerodendrons. It forms a large bush or small tree with large cordate leaves and terminal cymes of flowers, the calyx of

which is red and the corolla white. It is increased by root-cuttings, and in favourable situations attains a height of 10 feet in three or four years. Japan, 1800.

CLETHRA.—Deciduous or evergreen shrubs of small size, with simple toothed leaves, and terminal spikes or panicles of white flowers, produced from July to October. Natives of North America.

C. alnifolia.—This, and the allied species or varieties, *C. tomentosa*, *scabra*, *paniculata*, and *acuminata*, are quite hardy, and grow about 5 or 6 feet high, the last attaining a height of 10 to 15 feet in its native country. Flowers in erect racemes, produced in autumn, very fragrant.

CLIANTHUS puniceus, Parrot Flower.—A handsome shrub of erect habit, with pinnate leaves, and showy papilionaceous scarlet flowers in May or June. It requires the protection of a wall even in the most favoured localities, and is very well suited in habit for training. New Zealand, 1832.

COLLETTIA.—A genus of very curious shrubs only hardy in the south, or especially warm localities in the north. They have scarcely any leaves, but are armed with strong spines. *C. spinosa* and *C. cruciata*, natives of South America, have dull-white flowers.

COLUTRA arborescens, Bladder Senna.—A rapid-growing shrub about 10 feet high, with unequally pinnate leaves, and yellow papilionaceous flowers, followed by large bladder-like pods of a reddish tinge when ripe. Suitable for filling up shrubberies or plantations in almost any situation. South Europe, 1570.

COMPTONIA asplenifolia, American Sweet Fern.—A straggling, rather irregularly branched myricaceous shrub, 3 to 5 feet high, with elegantly-lobed fern-like fragrant leaves. The flowers are small and inconspicuous. North America, 1714. It prefers moist peaty soil and a shady situation.

CORDYLIN.—The New Zealand species of this genus are hardy in the south-west, and from their distinct habit of growth they merit a place, even if cut down in severe winters. They form miniature trees, with slender usually unbranched stems, long narrow flag-like leaves, and large panicles of small white flowers. *C. australis*, *C. Banksii*, and *C. indivisa* flower in the open air in the milder parts of England and Ireland. They are usually called *Dra-cenas*.

CORBARIA myrtifolia.—A handsome free-growing Myrtle-leaved shrub from 3 to 6 feet high, with the three-nerved leaves lanceolate. Flowers inconspicuous, succeeded by poisonous berries. Rather tender. Mediterranean region. 1629. *C. japonica* is a hardier plant. It grows 2 to 3 feet high, and is chiefly valuable for its brightly-coloured red fruits. Japan.

CORNUS.—Elegant shrubs with simple leaves and white or yellow flowers.

C. alba.—A shrub 5 to 10 feet high, with deep-red bark, obovate-oblong leaves, and white flowers, succeeded by white fruit. A very effective shrub, especially in winter, on account of the bright colour of the bark. North America, &c., 1741. *Var. Spathii* has bright-yellow leaves, and is one of the best shrubs with foliage of that colour.

C. circinata (C. rugosa).—Similar to the last in size and colour of the flowers, but it has larger, broader leaves, and the young shoots are covered with warty excrescences. North America, 1784.

C. florida, Flowering Dogwood.—A beautiful small tree, attaining in the United States a height of 30 feet. The umbellate flowers are surrounded by a large white

involucre. It should be planted in the sunniest positions only. North America, 1731.

C. Kousa.—A very beautiful species, producing its flowers about midsummer. The involucre measures 3 inches across and is white. Japan.

C. Mas (mascula), Cornelian Cherry.—This is more commonly grown than the North American Dogwoods, and usually as a shrub. It has yellow flowers, which are freely produced in February, while it is still leafless. There is a very ornamental variegated variety, which bears an abundance of handsome scarlet fruit. Germany, 1596.

C. sanguinea, Dogwood.—This is one of the prettiest of our native shrubs. Young shoots bright red; flowers white; fruit purple.

COROKIA Cotoncaster.—A pretty evergreen shrub with small grayish leaves and numerous small, star-like yellow flowers. The branches and twigs interlace with each other in a very curious manner. It needs a wall. New Zealand.

CORONILLA Emerus, Scorpion Senna. An undershrub, growing from 3 to 6 feet high, with elegant pinnate foliage, and yellow papilionaceous flowers, red in bud. The petals are remarkable for their long narrow claw. April to June. Southern Europe, 1596.

CORYLOPSIS spicata.—A handsome shrub, having Hazel-like leaves, and drooping bracteate spikes of yellow fragrant flowers, produced in spring before the foliage is developed. Japan, 1862.

CORYLUS, Hazel-nut.—This is ornamental in some of its forms, and many of the varieties are useful for their fruit.

C. Avellana, Hazel.—A useful shrub, of which several varieties are grown in gardens, such as *heterophylla*, with cut leaves, and *purpurea*, with deep-purple foliage. The latter is a very effective shrubby plant.

C. Colurna.—A tree 30 feet high, with ovate-cordate leaves. Asia Minor, 1665.

COTONEASTER.—This genus includes both deciduous and evergreen species, which vary also in habit from large shrubs or small trees to dwarf or prostrate bushes. With scarcely an exception the whole of the Cotoncasters may be described as worthy of a place in gardens. The larger species are of extremely graceful habit, whilst the dwarf species make neat, compact bushes which, when furnished with the numerous bright-red fruits, are charming objects. With the exception of *C. vulgaris*, found wild in Europe as well as in Asia, the Cotoncasters mentioned below are confined to Northern Asia.

C. affinis.—A small tree, with lanceolate leaves, cymose flowers, and scarlet berries. Himalayas.

C. bacillaris.—A deciduous shrub of robust growth; leaves oblong, tapering gradually towards the petiole. The whitish flowers are borne on short cymes. Fruit black.

C. buxifolia.—An evergreen shrub 4 to 12 feet high, with oblong leaves, 1 inch long, silky beneath, and distinctly fringed on the margins. Berries dull crimson. 1824.

C. frigida.—A shrub or small tree with oblong, pointed leaves, which in mild winters remain on the branches, along with the red fruits, for the greater part of the season. A robust grower, attaining a height of from 10 to 20 feet. 1824.

C. horizontalis.—A very distinct and handsome shrub of recent introduction. Its stems grow horizontally, only extending upwards when against a wall. The leaves are deciduous, small, and of a very deep green; the fruits are oval and red.

C. microphylla.—An evergreen species of dense habit with short branches, and obovate leaves less than $\frac{1}{2}$ inch long. Berries crimson. 1824.

C. Nummularia.—An elegant shrub or small tree, sub-evergreen, growing 10 to 15 feet high; fruit black. 1824.

C. rotundifolia.—A shrub 2 to 4 feet high; branches long, straight, leaves round, about $\frac{1}{2}$ inch in diameter. Berries bright-scarlet. 1825.

C. Simonsii.—A handsome species, of free bushy growth, with ovate leaves, and orange-coloured berries. It forms a handsome standard, but thus grown it is sub-evergreen. Khasya, 1850.

C. thymifolia.—Similar to *C. microphylla*, but smaller in all its parts. A very slow-growing trailer, with flowers tinged with pink.

C. vulgaris (*C. integerrimus*).—Height 3 to 5 feet; leaves oblong or ovate, pubescent underneath; fruits usually red; but in one variety, *melanocarpa*, they are black. This species is usually employed as a stock for grafting the dwarf species on. It is found on Great Orme's Head in Carnarvonshire.

CRATÆGUS.—Trees of small or moderate dimensions, with showy flowers, succeeded in some species by handsome berries. There are many other species besides those enumerated below.

C. Carrièrei.—A very handsome tree of unknown origin, with pinkish-white flowers and bright-red fruits persisting through the winter. 1883.

C. coccinea.—Foliage relatively large; flowers white; fruits large, bright-red. North America, 1683. *C. mollis* is closely allied to this, and is frequently confounded with it. It differs in having very pubescent leaves, and in its larger flowers having a more conspicuous red centre.

C. oordata, Washington Thorn.—The latest flowering of all the Thorns; flowers white. North America, 1738.

C. Crus-galli, Cock's-spur Thorn.—Flowers large, white; fruits bright-red, showy. There are several varieties under such names as *ovalifolia*, *pyracanthifolia*, *prunifolia*, and *splendens*. North America, 1691.

C. Oxyacantha, Hawthorn or White Thorn.—The varieties of this hardy native tree are exceedingly numerous. We need only mention the double-white, double-pink, and double-scarlet, the single-scarlet flowered, *Gumperi*, and others, as effective in plantations in spring. There is an elegant pendulous and also a fastigate variety. The Glastonbury Thorn—var. *præcox*—is frequently in bloom in midwinter.

C. pinnatifida (fig. 362).—A fine species, with large, very-deeply-lobed leaves. Flowers and fruits large, the latter deep-red when ripe. China. The variety *major* (*C. Layi*, *C. chinensis*, *C. tartarica*) is one of the most striking of all the Thorns. The leaves are 4 to 6 inches long, rich glossy green, the flowers and fruits still larger and handsomer than in the type.

C. Pyracantha, Fire Thorn.—This is one of the most showy of all evergreens in winter, when covered with its large clusters of orange-scarlet berries. It is exceedingly hardy, and will succeed on an east or north wall. The pinkish-white flowers appear in May. In the open it forms a dense bush. The typical form was introduced from the south of Europe in 1629. Another, slightly different, from the mountains of Northern India, *C. crenulata*, has more ornamental foliage, and the berries are vermillion. There is also a less ornamental variety with white berries.

C. tanacetifolia.—A small deciduous tree, with deeply-pinnatifid downy leaves. The flowers are white and the calyx much divided. Levant, 1789.

CYDONIA. See **PYRUS**.

CRATÆGUS.—This genus contains numerous showy species, the flowers of which are nearly always of some shade of yellow, but in some species they are purple, in others almost white. Naturally, these shrubs become gaunt and leggy with age, and it is necessary to keep the stock replenished with young plants grown on from seed or cuttings. A great deal may be done to keep them in shapely form by frequent topping when young. Much confusion exists in gardens between this genus and **LABURNUM**, **GENISTA**, and **SPARTIUM**, which see.

C. albus, White Portugal Broom.—A species with slender, terete branches and very little foliage; flowers white; height 6 to 10 feet. South Europe, 1752.

C. Ardoini.—A prostrate plant under 1 foot in height; flowers rich yellow. Alps of South Europe, 1867.

C. biflorus.—A shrub 3 to 5 feet high, producing long graceful shoots clothed with trifoliate silky leaves and yellow flowers in April and May. It should be cut back immediately after flowering. Hungary, 1760.

C. kewensis.—A hybrid raised at Kew between *C. Ardoini* and *C. albus*. It is quite prostrate and the flowers are creamy white. 1892.

C. nigricans.—A pretty shrub about 3 feet high, with small leaves, and terminal racemes of yellow flowers, appearing in June or July. Austria, 1730.

C. præcox.—A hybrid between *C. albus* and *C. purgans*, flowers sulphur-yellow. One of the earliest to blossom.

C. purpureus.—This is one of the most attractive of the genus. It is sometimes grown as a standard on the Laburnum. There are white, rose, and purple-flowered varieties. *C. Adami* is supposed to be a graft hybrid between this and the Common Laburnum, as the same tree simultaneously bears flowers of both species. Southern Europe, 1792.

C. scoparius, English Broom.—The common golden-yellow wild form of this plant is exceedingly showy; there are also equally handsome white, sulphur-coloured, double-flowered, and pendulous varieties in cultivation. The variety known as *Andreanus* (*Genista Andreana*) is



Fig. 362.—*Crataegus pinnatifida*.

one of the most beautiful shrubs introduced in recent years. The outer petals are of a deeper yellow than in the type, whilst those of the keel are of a rich brown-crimson. Normandy, 1886.

DABOECIA *polifolia*, St. Daboc's Heath.—A pretty evergreen shrub, native of Ireland, growing from 1 to

2 feet high. It has small dark-green foliage, and terminal racemes of globular white, pink, crimson, or purple flowers according to the variety, appearing towards the end of summer and continuing till November.

DAPHNE.—Dwarf or trailing shrubs with undivided leaves, and usually highly odoriferous flowers. This genus includes some of the most desirable of small evergreen and deciduous shrubs. In addition to those enumerated below, *D. indica rubra* and *alba*, and some others, which are commonly treated as greenhouse shrubs, will succeed against a wall. They all prefer a peaty soil, but thoroughly rotten leaf-mould and turfy loam will replace it.

D. Cneorum (fig. 363).—A prostrate trailing evergreen shrub with narrow linear leaves, and bright rosy-red

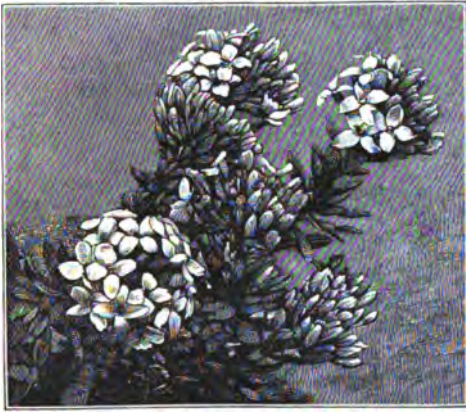


Fig. 363.—*Daphne Cneorum*.

fragrant flowers, appearing in great profusion in early spring. Europe, 1752. There is a variegated variety, and another with white flowers.

D. Laureola, Wood Laurel.—This indigenous shrub grows about 2 or 3 feet high, and is worth planting in shady places for its glossy foliage, and its greenish-yellow sweet-scented flowers, from February to March. British.

D. Mezereum, Mezereon.—A small erect shrub 3 to 6 feet high, with pink, rose, purplish, or white flowers, produced all along the branches very early in spring before the leaves appear, and succeeded by scarlet or yellow berries. The berries and bark are poisonous. Europe, and possibly indigenous in England. Var. *grandiflorum* has deep-purple flowers, $\frac{3}{4}$ inch across, produced in November.

D. pontica.—Very similar to the *D. Laureola*, but differing in the lighter-green foliage and decidedly yellow flowers, which appear in April and May. Asia Minor, 1759.

D. sericea (*D. collina*).—An erect-growing species about 2 feet high, with small oblong-obovate leaves, and terminal clusters of hairy rose-coloured flowers, produced through the winter and spring. *D. neapolitana* is a variety with purple and white flowers. South Europe, 1752.

DAPHNIPHYLLUM.—A small genus of evergreen Japanese shrubs of handsome close-growing character. *D. glaucescens* grows to a height of 6 or 8 feet, and has pointed leaves 6 to 8 inches long, glaucous on the lower surface. *D. jezoense* is similar in character, but dwarfer. Both are liable to be cut by frost when young, but otherwise are quite hardy.

DECUMARIA sarmentosa.—A trailing shrub of small size, with simple leaves and white flowers, only produced in warm situations. North America, 1834.

DESFONTAINEA spinosa.—A charmingly beautiful evergreen shrub of dense compact habit, with opposite leaves, which are waved and spiny-lobed like those of a Holly; the flowers are axillary, tubulose, deflexed, 2 inches long, bright-scarlet tipped with yellow. The cultivated plant was introduced from Chili in 1850, but it extends over the Andes, being also found in Peru, Equador, &c. It is hardy only in a rather shady sheltered position in the south or west.

DEUTZIA.—Highly ornamental undershrubs, with small simple leaves, and pure-white or pink fragrant flowers, produced in spring.

D. crenata.—An erect shrub with numerous slender stems, from 4 to 8 feet high, and exceedingly chaste white or pink flowers. There are two double-flowered varieties, one white, the other pink. Japan, 1833.

D. gracilis.—A very attractive dwarf, erect shrub, from 2 to 3 feet high, with axillary racemes of pure white flowers appearing with the leaves in early spring. It is quite hardy, and will, unless injured by late frosts, develop its full beauty in the open ground; it is also much used for forcing. Japan, 1843.

D. Lemouinei.—A hybrid between *D. gracilis* and *D. parviflora*. Its pure-white flowers are borne in great profusion. 1894.

D. setchuensis (*D. corymbiflora*).—A new and singularly beautiful shrub, introduced from China in 1895. It grows about 4 feet high, with elegant drooping branches, clothed in June with pure snow-white flowers.

D. staminea (1841) and *D. corymbosa* (1838) are two showy North Indian species.

DIERVILLA (including *Weigela*).—Handsome shrubs, bearing simple opposite leaves and showy bell-shaped or funnel-shaped clustered, pink-rose or white flowers. Probably some of the garden varieties are of hybrid origin. All flower in spring and early summer.

D. amabilis.—A form of *D. florida* which grows 8 or 10 feet high, and has strongly reticulated leaves, the veins being particularly prominent below. China, 1855. The varieties referred here, probably some of them hybrids, are: *Iolima*, white flowers with a yellow blotch in the throat; *striata*, striped red and white flowers; *Van Houttei*, white and pink; and *Steleneri*, purplish-red, very floriferous.

D. canadensis.—A less showy species, with yellow flowers; it forms a dwarf hardy shrub, about 3 or 4 feet high. North America, 1739.

D. florida (*Weigela rosea*).—A very ornamental free-flowering species, producing a profusion of rosy or whitish flowers in April or May. Height 6 to 8 feet. The varieties are numerous. China, 1845.

D. Middendorffiana.—This has ovate-lanceolate, finely reticulate leaves, hairy on the veins. Flowers yellowish-white, dotted with pink on the lower petal. Siberia.

Useful hybrid Diervillas are:—*Abel Carrière*, flowers rich red-purple, and *Eva Rathke*, rich bright-red flowers.

DIOSPYRUS.—Low trees, with simple leaves, and inconspicuous flowers. The species are only suitable for the south and south-west.

D. Lotus, Date Plum.—A tree 20 feet high, with dark glossy green leaves. Caucasus, &c., 1596.

D. virginiana, Persimmon.—A tree 20 to 30 feet high; leaves green, glossy. Bears an edible fruit greatly esteemed in North America.

EDWARDSIA grandiflora (*Sophora tetraptera*).—A handsome New Zealand shrub with pinnate leaves and showy yellow papilionaceous flowers, in large clusters. It needs the shelter of a wall. 1772. *E. microphylla* is a variety with very small leaflets and smaller flowers.

ELÆAGNUS.—Shrubs or small trees with usually inconspicuous but very fragrant flowers; fruit drupe-like. Within the last few years several handsome variegated varieties of Japanese evergreen species have been introduced, well suited for walls and sheltered places, and the south-west coast. They have undivided leaves, which, as well as the young shoots, are more or less clothed with ferruginous or silvery scales. There are beautiful gold and silver variegated varieties of *E. pungens* and *E. glabra*.

E. angustifolia (*E. hortensis*), Oleaster.—A handsome hardy shrub with a few scattered spines; leaves clothed with silvery, glistening scales. Flowers yellow, fragrant, succeeded by red drupes in late summer. South of Europe and Asia Minor, 1633. There are two or three varieties in cultivation, including one with larger edible fruit.

E. argentea, Silver Berry.—A spreading shrub with rusty-brown branches, silvery foliage, and small yellow flowers appearing in summer. Hudson's Bay, 1813.

E. longipes.—A handsome spineless shrub, with silvery leaves studded with brown scales, and flowers on very long stalks, succeeded by oblong orange-coloured acid berries, rendering it very ornamental when in fruit. In Japan there are numerous varieties, some having, it is said, fruit of good flavour. 1872.

E. macrophylla.—This bears the largest leaves of any of the species. They are dark glossy green above, silvery beneath. The flowers are grayish-white, fragrant, and produced in October. China and Japan.

EMBOTHEM coccineum.—A handsome tree with leathery oblong leaves and terminal clusters of long pendent orange-scarlet flowers, appearing in May; only hardy in the south-west. Chili, 1851.

EMPETRUM nigrum, the Crowberry, and its variety *rubrum* are two dwarf, Heath-like shrubs with small reddish flowers followed by berries which in *nigrum* are brownish black, and in *rubrum* red. The species is widely spread over both hemispheres.

ENKIANTHUS.—A small genus of ericaceous shrubs, of which the two following are deciduous and have proved hardy in the south of England.

E. campanulatus.—A dwarf shrub with elliptical leaves and racemes of pendent flowers, which are white, tinged with red. Japan.

E. japonicus.—This produces its white pendent flowers early in spring. The leaves turn a beautiful golden colour in autumn. Japan, 1870.

EPHEDRA altissima, *monostachya* and *distachya* are trailing or twining shrubs resembling *Equisetum*, but nearly allied to the Conifers, natives of the south of Europe and the saline regions of Siberia, and suitable for planting in the vicinity of the sea in the south and west. They have small scale-like leaves and quite inconspicuous flowers, but the slender jointed branches are evergreen, and the berries are red or black.

EPIGÆA repens.—A creeping evergreen shrub, with oval or heart-shaped leaves, and erect dense spikes of white or pink deliciously-scented flowers, appearing in June or July. A native of North America, inhabiting pine woods and other sheltered shady situations, a fact to be observed in its cultivation. 1736.

EROCILLA spicata (*Bridgenia spicata*).—This shrub climbs or clings after the manner of Ivy, and for warm situations it is a very welcome addition to our rather limited number of evergreens of this class. It has simple toothed dark-green leaves, and reddish flowers, produced in great profusion in spring. Chili, 1840.

ERICA.—The true Heaths are the hardiest and most

easily cultivated of the tribe, while some of them are among the most desirable on account of their early and free-flowering qualities. The species and varieties in cultivation are very numerous, and some of those not mentioned here are equally as good as the others. They are all evergreen, varying from a few inches to several feet in height under favourable conditions. In habit, foliage, and flowers the hardy species all exhibit a general resemblance to the native ones, varieties of which are also cultivated.

E. carnea (*E. herbacea*).—This is a dwarf, dense, prostrate species, of which there are white, pink, and purple flowered varieties. For edging large beds or filling small ones this is unequalled, and its early-flowering season—January or February onwards—renders it indispensable, especially as it will succeed in almost any ordinary garden soil. Germany, &c., 1763.

E. ciliaris.—A native of the west of England and Ireland, growing from 1 to 2 feet high, and having hairy glandular foliage and crimson flowers, the anthers not projecting beyond the corolla. A very pretty species, flowering in summer.

E. cinerea.—The common native crimson-purple species, which usually grows from 1 to 2 feet high, but occasionally from 3 to 4 feet. There are white, crimson, and other varieties in cultivation. It blooms during the latter half of summer and the beginning of autumn.

E. codonodes will thrive in a light sandy soil, and attain a height of 10 feet or more in the south of England. It produces its small white and pink flowers in great profusion from January or February till May, and is one of the most desirable flowering shrubs for sheltered gardens. *E. scoparia* and *E. arborea* differ in stature, and in the size, shape, and colour of the flowers, but are not superior to *E. codonodes*. Some of them have been in cultivation since 1658.

E. mediterranea.—A variety of this, called *hibernica*, is found in Ireland. It grows from 2 to 5 feet high, and has pink flowers, with slightly projecting anthers. White-flowered, dwarf, and other varieties may be procured from nurserymen. April and May is the season of flowering. *Hybrida*, a supposed hybrid between this and *E. carnea*, is one of the loveliest of hardy Heaths, and sometimes flowers about Christmas.

E. Tetralix.—The Cross-leaved Heath is perhaps the prettiest of our native species, the delicate rose-pink flowers being borne in terminal clusters; it flowers in summer and autumn. There are several varieties, differing in the colour of their flowers.

E. vagans.—This is readily distinguished among our native species by its largely-protruding anthers and pink flowers. In this country it is only found in Cornwall. White, red, and flesh-coloured varieties are grown. It flowers in July and August.

E. vulgaris (*Calluna vulgaris*).—The varieties of the common Ling are very numerous and pretty, including many different colours, and also double flowers, variegated and golden foliage, &c. The dwarf varieties form useful edging plants in the American garden. Both this and *E. cinerea* will thrive on poor sandy soil, the former attaining a height of 4 to 6 feet on the heaths in the weald of Sussex. Late summer and autumn.

ESCALLONIA.—Ornamental summer flowering shrubs from South America, suitable for shrubberies in the warmer parts of the kingdom, or for covering a wall. They flourish admirably near the sea. The flowers vary from white to pink and deep-red, and the undivided usually serrated leaves are often glandular.

E. exoniensis.—A hybrid between *E. rubra* and *E. Phillipiana*; flowers white; foliage like *E. rubra*.

E. langleyensis is a hybrid between *E. Phillipiana* and *macrantha*. It resembles the former in the shape of the flower, but the colour is red. It is perhaps the hardiest of the red Escallonias. 1897.

E. macrantha.—This in its different varieties is one of the best in cultivation, especially in Devon and Cornwall, where it is used as a hedge plant. It is of robust habit, with coriaceous shining leaves, and flowers varying from red to crimson. The variety *sanguinea* has very deeply coloured flowers. Chiloe, 1847.

E. Phillipiana (fig. 364).—The hardiest of all the Escallonias, and quite distinct from any other. The leaves are small, deep-green, and spatulate; the flowers are small, white, but produced in numerous panicles. This

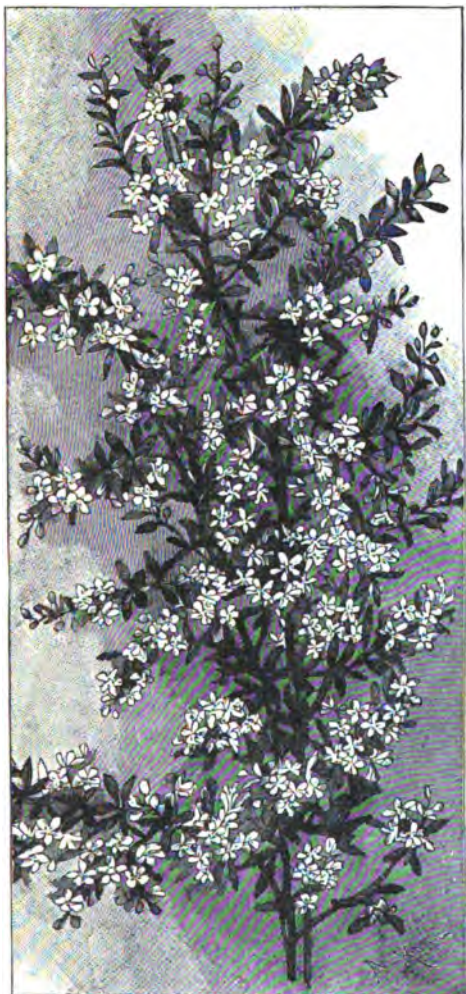


Fig. 364.—Escallonia Phillipiana.

is the best species for the colder parts of the country. Valdivia, 1873.

E. rubra.—Similar to *E. macrantha*, but more slender, with more coarsely serrated leaves, and smaller flowers, both red and white. It is also hardier. Chili, 1827.

EUCRYPHIA pinnatifolia (fig. 365).—A beautiful deciduous shrub 10 to 15 feet high, with dark-green, pinnate

leaves. The flowers are pure-white, about 3 inches in diameter; petals four in number. The centre of the



Fig. 365.—Eucryphia pinnatifolia.

flower is filled by a large cluster of yellow stamens. Flowers in August. Chili, 1877.

EUONYMUS.—The deciduous species here mentioned are perfectly hardy and are valued for the autumnal tints of the leaves, or for the brilliantly coloured fruits. The evergreen kinds are more tender and suffer in severe winters. On the south and west coasts, however, they are perfectly hardy.

E. americanus.—A dwarf shrub similar to the following, but it has thicker leaves, and prickly scarlet capsules. North America, 1686.

E. atropurpureus, Burning Bush.—About 5 to 10 feet high, with small purple flowers and smooth scarlet capsules. North America, 1756.

E. europæus, Spindle-tree.—This native shrub or small tree is very ornamental in autumn, when the pale scarlet fruits open and reveal the orange-coloured aril of the seeds. It rarely exceeds 8 to 10 feet in height, but sometimes under cultivation attains a larger size.

E. japonicus.—An erect shrub, attaining a height of 10 feet in favourable situations. The ordinary green-leaved variety is one of the most ornamental evergreen shrubs of small gardens in many towns on the south and west coasts; and the variegated varieties are extremely numerous and diversified, including yellow and white variegations of various patterns, with an infusion of red in some. The name *latifolius* has been given to some of the broad-leaved varieties. The typical form, and one with variegated leaves, were introduced from Japan many years ago, but most of them are of comparatively recent acquisition.

E. radicans.—This is a straggling, prostrate or climbing

variety of *japonicus*, and is well adapted for covering rocks, or for slowly covering a wall, as it emits roots from the branches in the same way as the Ivy, and is self-supporting. In a light soil the variety *tricolor* forms an attractive border to a bed of shrubs. There are white and yellow and red variegations. It is the hardiest of the evergreen varieties.

FABIANA imbricata.—An elegant small shrub with the habit of a Heath, bearing a profusion of pure-white slender long-tubed flowers in May or June. Should have the protection of a wall unless in a mild climate. Chili, 1838.

FAGUS sylvatica, Beech.—Besides the ordinary form of this noble tree, there are several striking varieties worth



Fig. 366.—*Fagus sylvatica pendula*.

growing. The principal ones are *F. s. purpurea*, with deep-purple foliage, not to be confounded with *cuprea*, which is of a less pleasing coppery tint; *aureo-variegata* and *argenteo-variegata*, gold-striped and silver-striped; *heterophylla* (*inoisa*, *asplenifolia*), with elegantly-cut foliage; and finally, *pendula*, the weeping form of the type (fig. 366), and *purpurea pendula*.

FATSIA japonica (*Aralia japonica*).—A fine evergreen shrub, the leaves of which are broad, of a palmate form, deep-green and glabrous. It flourishes in sheltered positions in the warmer parts of the kingdom, producing its large panicles of ivory-white flowers in winter.

F. papyrifera (*Aralia papyrifera*), Rice-Paper Tree.—A handsome small woody simple-stemmed plant, with light-green palmate leaves, woolly, especially beneath. Suitable only for the warmer parts of the kingdom. In China, its native country, the pith of this plant forms the well-known rice-paper.

FORSYTHIA.—Erect or diffuse shrubs with simple and trifoliate leaves on the same branch, and yellow four-petalled flowers produced in early spring before the leaves. Natives of Japan and China.

F. suspensa (*F. Fortunei*).—This species has long slender branches, which flower freely in early spring. It is equally well adapted for a wall or trellis or for the open ground. Introduced into Holland in 1833, but did not reach this country till about 1850.

F. viridissima.—An erect shrub from 4 to 8 feet high, with simple lanceolate dark-green leaves and a profusion of yellow flowers. China, 1845. *F. intermedia* is a hybrid, intermediate in habit, flowering after *suspensa* but earlier than *viridissima*.

FOTHERGILLA alnifolia (*F. Gardneri*).—A dwarf shrub with slender crooked branches, ovate leaves covered with a silvery down beneath, and white fragrant flowers in terminal spikes, appearing before the leaves. North America, 1765.

FRAXINUS.—A large genus of trees with pinnate leaves and key fruits. There are several from North America and Japan, but they do not excel our native Ash in beauty.

F. excelsior, Ash.—The best varieties are the gold-barked *aurea*, the gold and silver striped and blotched, and the weeping *pendula*; *monophylla* has most of the leaves reduced to a single leaflet; *laciniata* has much-divided leaflets, and *crispa* has dark-green curled foliage.

F. lentiscifolia.—A native of Asia Minor, introduced in 1710. Leaflets long and slender. The variety *pendula* is an elegant weeping tree.

F. Mariesii.—A small tree of the *Ornus* group. The flowers are in erect panicles and white. Leaflets five to each leaf. China, 1880.

F. Ornus (*Ornus europæus*), Flowering Ash.—This is remarkable for its dense pendulous clusters of white flowers in spring. South Europe, 1730.

FREMONTIA californica.—A handsome half-evergreen shrub with cordate lobed leaves, and bright-yellow flowers about 2 inches in diameter, appearing in spring. It is not hardy, except in the south-west, and even there the shelter of a wall is desirable.

FUCHSIA.—Although in most parts of the kingdom the species of this genus must be treated as herbaceous plants, and cut down annually, in the more favoured parts of the south and west they succeed either in the open or against a wall. Where it is possible to have them thus, they form the most ornamental of flowering shrubs. All the hardiest varieties belong to the Chilean species *F. macrostemma*, of which *F. magellanica* is a synonym. *Riccartoni*, *globosa*, and *coccinea* are the best varieties for the open ground.

GABRYA elliptica.—A handsome evergreen shrub with dark-green coriaceous leaves, and yellowish-green catkins



Fig. 367.—*Garrya elliptica*. (4.)

borne in clusters near the tips of the branches, from November till February. The male plant (fig. 367) is the handsomer. Height 5 to 10 feet. North America, 1828.

GAULTHERIA.—Evergreen procumbent or half-erect branching shrubs from North America.

G. procumbens.—A diminutive plant from 4 to 6 inches high, with lanceolate leaves, and axillary white flowers in July or August, succeeded by red berries, which do not drop until the following spring. 1762.

G. Shallon.—A sub-erect shrub from 2 to 3 feet high, with broadly heart-shaped, almost stalkless, abruptly-pointed leaves, and bracteate racemes of pink and white flowers produced in summer. Berries purple, edible, and used in tarts, &c., in North America, under various names. Grows in shady woods as well as in the open, on a sandy loam or peat. 1826.

GENISTA.—Prickly or unarmed shrubs, with small, usually trifoliate leaves, and flowers nearly always yellow. They are chiefly from the Mediterranean region, and succeed well in the vicinity of the sea, and on poor sandy soil, in all except the coldest parts of the kingdom.

G. aetnensis, Mount Etna Broom.—A tall plant, 10 feet or more high; it has but few leaves, the long slender branches being terete and producing abundant yellow flowers in June and July. Sicily, 1816.

G. hispanica.—A dwarf spreading bush not unlike the common Gorse. Its spiny branches bear terminal heads of golden-yellow flowers in June. Spain, &c., 1759.

G. pilosa.—A procumbent plant, useful near the edges of a shrubbery or on a rockery. Its bright-yellow flowers are borne very freely in summer. Europe (Britain).

G. radiata (*Spartium radiatum*).—A dwarf shrub about 2 or 3 feet high, bearing terminal clusters of yellow flowers in June or July. South of Europe, 1758.

G. sagittalis.—A dwarf leafless shrub about a foot high, with winged foliaceous stems, and terminal yellow flowers in May or June. Alps, 1750.

G. tinctoria, Greenweed.—There is a double-flowered variety of this indigenous species suitable for planting in stony places, &c.

G. virgata.—The most beautiful of all the taller Brooms. It forms a bush 10 feet high and 15 feet through, of rounded habit. The leaves are small, simple, and covered with silky pubescence. It blooms profusely in May and June, the flowers being bright golden-yellow.

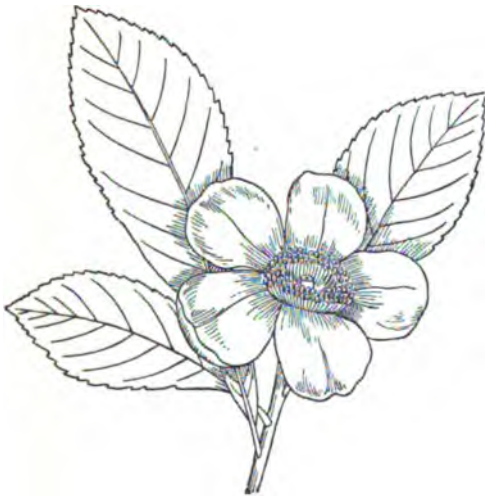


Fig. 368.—*Gordonia pubescens*. (3.)

Useful for planting in partially wooded tracts of ground. Madeira, 1777.

GLEDITSCHIA.—Symmetrical trees with pinnate or bipinnate leaves; flowers small, greenish-white. The

trunks are mostly armed with simple or branched, often very formidable spines.

G. triacanthos, Honey Locust.—A handsome tree, 50 to 80 feet high; thorns trifid; seed-pods long, thin, twisted, and pendent. The leaves assume a beautiful yellow colour in autumn. North America, 1700.

GORDONIA pubescens (*G. Altamaha*) (fig. 368).—A small deciduous tree from North America, allied to the Camellia, having large agreeably-scented white flowers produced in autumn. It is hardy only in the warmer parts of Britain, 1774.

GRISSELINIA.—A New Zealand genus of which there are two species, *G. littoralis* and *G. lucida*. Beautiful evergreens, having oblique coriaceous shining leaves, and small inconspicuous flowers. They thrive well at the seaside, but are cut down in severe winters.

GYMNOCLADUS canadensis, Kentucky Coffee.—Allied to *Gleditschia*, and of very singular habit. It has a bare appearance in winter, the branches being few and thick, but in summer is singularly effective, from the size and elegance of its leaves. Height 50 to 60 feet. Canada, 1748.

HALESIA.—Small trees, with white pendulous flowers produced in spring; they like a moist sheltered position.

H. tetraptera, Snowdrop Tree.—A tree 20 to 30 feet high, with simple leaves, white flowers in May, and four-winged seed-vessels. Very ornamental. Carolina, 1756.

HALIMODENDRON argenteum, Salt Tree.—A very hardy shrub with silvery hairy leaves, and pinkish flowers in May or June. Often grown as a standard grafted upon the Laburnum, or on *Caragana arborescens*. Siberia, 1779.

HAMAMELIS.—There are four species in cultivation, one from North America, the others from China and Japan. They are small ornamental trees, flowering in autumn and very early in spring, the small yellow petals resembling short twisted threads. They are leafless when in bloom.

H. arborea.—A small tree, the clear, bright-yellow petals contrasting most effectively with the rich, red calyx. Flowers from January to March. Japan.

H. japonica (fig. 369).—Nearly allied to the preceding, but of dwarfer habit. The flowers, too, are of a paler colour. Japan. Var. *Zuccariniana* has lemon-coloured flowers.

H. mollis.—This is distinct from the others in having larger leaves, covered beneath with a thick, felt-like mass



Fig. 369.—*Hamamelis japonica*, var. *Zuccariniana*.

of hairs. The flowers are also brighter yellow than in the other species, and the petals less twisted. China, 1897.

H. virginica, Witch-Hazel.—A very hardy shrub or small tree, with obovate leaves, and clustered yellow flowers produced in autumn and winter. North America, 1736.

HEDERA, Ivy.—The varieties in cultivation at the present time are exceedingly numerous, and many of them highly ornamental. The "gold", "silver", and cut-leaved varieties should be employed only where the space is small, and preferably against a north wall. The former include marbled, margined, striped, spotted, blotched, and other kinds of variegation. There are also tricoloured variegations in which red is included. The same remark applies to those having cut or lobed leaves, as *palmata*, *pedata*, *sagittifolia*, &c. The common *H. Helix* and those green-leaved varieties sold by nurserymen under the names *canariensis*, *algeriensis*, and *Regneriana*, &c., are suitable for covering large spaces. The additional varieties named have usually larger bolder foliage than the common one, and they bear the name of giant Ivy in common. The tree Ivies of the nurseries are plants propagated from the flowering branches of the others in which the habit is more or less erect and all the leaves undivided. The common forms have black berries, but there is a fine yellow-berried form called *chrysocarpa* and *baccifera lutea*.

HEDYSARUM *multijugum*.—A loose-growing shrub 2 to 3 feet high, with pinnate leaves composed of numerous oblong gray-green leaflets. The flowers are borne on erect racemes, and are bright rosy-purple. Requires a sunny position. Mongolia, 1883.

HELIANTHEMUM.—Prostrate, trailing, or erect undershrubs, with yellow, white, or red flowers, resembling those of the genus *Cistus*, but much smaller. The species are numerous and very similar in appearance; they succeed well on rock-work, and are suitable for the front row of borders on a warm dry soil in the south-west parts of the kingdom.

H. formosum.—About 4 feet high, with three-nerved leaves, and large flowers for the genus—yellow, with a purple blotch at the base of each petal, produced throughout the summer. Southern Europe, 1780.

H. vulgare, Rock Rose or Sun Rose.—The varieties of this indigenous trailing species are the most desirable for general cultivation. The flowers, produced throughout the summer, vary from yellow in divers shades to rose and deep-red. The varieties are found in gardens under the names *croceum*, *roseum*, *grandiflorum*, *macranthum*, Fire-ball, Magenta Queen, &c. There are also double-flowered varieties.

HIBISCUS *syriacus* (*Althæa frutex*).—An ornamental shrub 5 to 8 feet high, with erect straight branches, and producing in September large, axillary, white, yellow, rose, purple, violet, and variously-spotted flowers. There are also double-flowered varieties of divers colours, and one with variegated foliage. Syria, 1596.

HIPPORHÆ *rharnoides*, Sea Buckthorn.—A low tree or shrub, with small linear leaves, and minute yellow flowers, succeeded by bright orange-coloured berries, which render it one of the most ornamental trees in winter. It is a native of the east coast of Britain, and very suitable for planting near the sea as a shelter. It grows satisfactorily even in positions that are occasionally drenched by the sea spray. Being dioecious, it is necessary for the development of fruit that trees of both sexes should be planted not far apart.

HYDRANGÆA.—Dwarf shrubs, with undivided or lobed

leaves, and terminal panicles or corymbs of white, pink, or blue flowers. The Chinese and Japanese species only attain perfection in sheltered situations, and they succeed admirably on the coast in the south and west of England, or in Ireland. The North American species are hardier, but less ornamental.

H. arborescens.—This resembles in habit the more familiar *H. Hortensia*, but its agreeably-scented flowers are nearly all fertile, that is, they have not the enlarged calyx which renders the inflorescence of the latter so conspicuous; they are borne in summer. North America, 1736.

H. Hortensia.—The varieties of this are numerous, but, except in the warmer parts of the country, they require protection in winter. The variety *Lindleyana* is the hardiest and has the outer flowers sterile and enlarged with either



Fig. 370.—*Hydrangea Hortensia* Marienii.

white or pink toothed lobes; *Marienii* (fig. 370) is remarkable for the large size of its pink barren flowers, which are 3 inches across; *cærulescens* has bright-blue sterile flowers; *Olaksa* has a very large inflorescence, in which nearly all of the flowers are sterile and of a blue colour; and *stellata prolifera* has pink flowers with several series of sepals in the sterile ones. There are also varieties having the foliage variegated with yellow and red. China, 1740.

H. paniculata.—Inflorescence much more elongated than that of *H. Hortensia*. The variety *grandiflora* (fig. 371) is a very handsome plant in which all the flowers are sterile and pure-white. It attains a height of 4 to 6 feet, and when in bloom, towards autumn, is very attractive. Japan.

H. petiolaris (*H. scandens*).—A climbing plant, quite hardy in the south, but needing a wall in the north. It resembles Ivy in mode of growth, and can be used for covering old tree stumps. Flowers white, in large broad cymes, appearing in June. Japan, 1876.

H. quercifolia.—A shrub about 3 feet high, with ovate, lobed leaves; the flowers greenish-white or pink, in part barren. Florida, 1803.

H. radiata (*nivea*).—A shrub; leaves white beneath, and white flowers, the outer sterile and enlarged; it grows from 4 to 6 feet high in its native habitats on the banks of the Savannah, but scarcely reaches that stature in this country. North America, 1786.

HYMENANTHERA crassifolia (fig. 372).—A dwarf shrub with short rigid branches and small linear-spathulate leaves. The flowers are dull-yellow and small, but they are succeeded by comparatively large white berries.

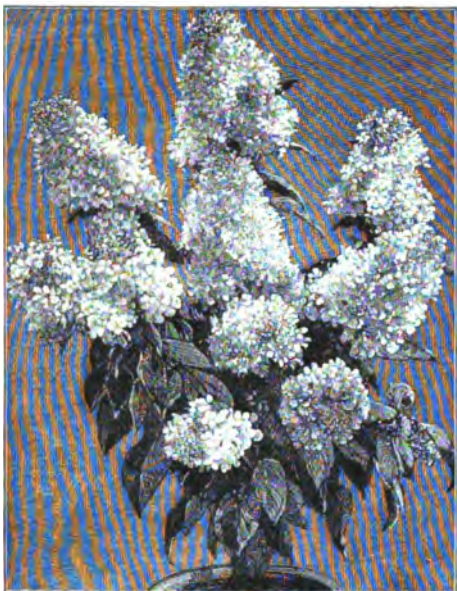


Fig. 371.—*Hydrangea paniculata grandiflora*.

Should be protected during severe frost. New Zealand 1875.

HYPERICUM.—Dwarf shrubs with opposite, short-stalked or sessile leaves, and yellow flowers with a conspicuous

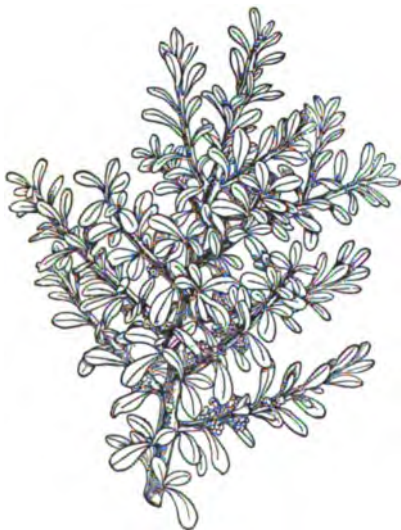


Fig. 372.—*Hymenanthera crassifolia*. (1.)

cluster of stamens. Several of the species are sub-evergreen, especially in mild winters.

H. Androsæmum, Tutsan.—This indigenous plant deserves to be planted in shrubberies on account of the pleasant odour of the dried leaves; it grows from 1½ to 2 feet high.

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H. calycinum, Rose of Sharon.—A dwarf shrub, with trailing underground stems forming thick tufts, bearing oblong glossy leaves, and showy yellow flowers from 2 to 3 inches in diameter. Valuable for covering banks, &c., especially as it succeeds well in shady places and under trees. South-east of Europe, now naturalized in Britain.

H. hircinum.—A half-evergreen shrub 3 or 4 feet high, flowering late in the summer and onwards till the end of October. Spain, 1640.

H. Hookerianum.—This grows 3 to 4 feet high, and is the handsomest of the taller species. The flowers are rich yellow, cup-shaped, and about 2 inches across. Habit erect. North India.

H. Kalmianum.—A North American species 2 to 4 feet high, which flowers in the summer months. Introduced in 1759.

H. Moserianum.—A hybrid between *H. calycinum* and *H. patulum*, having large golden-yellow flowers. It commences to blossom in July and continues for two months. It is killed to the ground in hard winters, and in severe weather should be covered by a thick layer of dry leaves.

H. patulum.—A very graceful plant, its slender stems bearing ovate pointed leaves and corymbs of bright-yellow flowers. Tender except in the south. Japan.

IDESIA polycarpa (*Polycarpa Maximowiczii*).—A tree of considerable size, with large cordate leaves and terminal panicles of small flowers, succeeded by clusters of purplish-black berries. Hardy only in the south and west. Japan, 1869.

ILEX.—The Hollies constitute a large genus spread over almost the entire globe. The species that are hardy in Britain number about a dozen, but the variety of the genus is enormously increased by the numerous forms of the common Holly. The perfect hardiness of these, their glossy, deep-green or variegated leaves, and their bright red or yellow fruits, render them perhaps the most useful of evergreens. The Holly is one of the best of our hedge plants.

I. Aquifolium, Holly.—Of the numerous named varieties the following are the most distinct and handsome: Green-leaved: *camelliaefolia*, *Doningtonensis*, *ferox* (hedgehog), *Hendersonii*, *Hodginsii*, *ovata*, *pendula*, *platyphylla*, *Shepherdii*, *tortuosa*, and *Whittingtonensis*. Silver-variegated: *argentea marginata*, *ferox argentea*, *argentea medio-picta*, Silver Queen. Golden-variegated: *aurea marginata*, Golden Queen, Golden Milkmaid, *Hodginsii aurea*, Waterer's. These varieties are increased by budding on the common Holly, or by cuttings.

I. cornuta (fig. 373).—A very striking species, usually seen in the form of a rounded shrub. The leaves are stiff, very dark green, and armed with five or seven stout spines. China, 1850.

I. crenata.—A slow-growing compact bush with small, ovate, crenate leaves under 1 inch in length. Used as a hedge plant in Japan. Strikes readily from cuttings in autumn.

I. latifolia and *I. integra* are two handsome Japanese species, the latter with unarmed leaves.

I. opaca (fig. 374).—The leaves of this are dull-green, ovate, with a few teeth on the wavy margins. North America, 1744.

INDIGOFERA Gerardiana.—An elegant, slender, branched shrub, very suitable for planting against a wall or in the open, where, however, it is usually cut back to the ground in winter. In spring it sends up freely its graceful shoots 2 to 3 feet high, clothed with delicate pinnate foliage. The flowers are rose-purple, and produced freely in late summer in erect racemes. North India.

ITEA virginica.—A dwarf shrub resembling a Willow in habit and foliage; flowers white, on erect spikes, produced in great profusion towards the end of summer.



Fig. 373.—*Ilex cornuta*. (i.)

Thrives best in a cool peaty soil and half-shady situation. North America, 1744.

JAMESIA americana.—A shrub 3 to 4 feet high. Leaves opposite, lanceolate, toothed; flowers white, in terminal panicles. Rocky Mountains, 1865.

JASMINUM.—Some of the Jasmines are nearly evergreen, others deciduous; they are valuable for covering house-



Fig. 374.—*Ilex opaca*. (i.)

fronts near the sea in the south-west. They are of rambling, not strictly climbing, habit, and the flowers have an agreeable fragrance.

J. fruticosans.—An almost erect half-evergreen species, with glossy three-leafleted leaves, and yellow flowers produced all through the summer. Fruits black and handsome. Southern Europe, 1570.

J. nudiflorum.—This has yellow flowers produced throughout the whole length of the flexible green branches from November onwards through the winter. China, 1844.

J. officinale, White Jasmine.—This is a fast grower, and will soon cover a large space. Its slender deep-green branches give it the appearance of an evergreen, although its leaves are deciduous. In its beautiful pinnate leaves and pure white sweet-scented flowers it is unequalled by any other of its class. It blooms from May till October. Asia, 1548.

J. revolutum.—This has pinnate leathery leaves, and yellow flowers borne in terminal clusters all through the summer. *J. pubigerum* is a variety in which the young shoots and leaves are hairy and the flowers smaller. Northern India, 1812.

JUGLANS.—The Walnut genus consists of handsome bold-habited trees, with pinnate leaves.

J. nigra.—A rapid-growing tree, of less spreading habit than the following, attaining a height of 60 to 100 feet. North America, 1656. *J. cinerea* is a somewhat similar and equally handsome tree, also North American. *J. cordiformis* and *J. Sieboldiana* from Japan, and *J. mandshurica* from Amurland, are new introductions which promise to be fine trees for this country. They have longer leaves than the others.

J. regia, Common Walnut.—A well-known fruit-bearing tree, 70 to 80 feet. Western Asia, about 1650. Among the ornamental varieties *laciniata* is one of the best.

KADSURA japonica.—A trailing rather tender shrub, with simple leaves, and solitary axillary yellowish-white flowers an inch in diameter, succeeded by heads of scarlet berries. Japan, 1846.

KALMIA.—Compact evergreen shrubs of small stature, with undivided leaves and showy hemispherical or bell-shaped flowers. Natives of North America.

K. angustifolia, Sheep-Laurel.—A dwarf shrub 1 to 2 feet high; leaves narrow, usually in threes; flowers smaller than in *K. latifolia*, and of a dark-red colour, produced from May to July. 1736.

K. glauca.—This grows to about the same height as the last, but is of less compact habit and has glaucous leaves; its lilac-purple flowers are produced in April. 1767.

K. latifolia, Calico Bush.—This and its varieties are most ornamental. They have shining leaves of a pleasing bright-green, and dense terminal clusters of beautiful delicate pink, rose, or nearly white spotted flowers, produced from May to July. 1734. *K. myrtifolia* is a miniature small-leaved variety.

KERRIA japonica.—A small shrub with slender, dark-green branches, lanceolate leaves, and orange-yellow terminal flowers. The familiar double-flowered variety was one of the earliest introductions from Japan, having been in British gardens since 1700. The single-flowered variety and the one with variegated foliage are better for growing in the open than the double variety, which is better on a wall. It used to be known as *Corchorus japonica*.

KOLREUTERIA paniculata.—A small tree of irregular growth, with unequally-pinnate leaves, yellow flowers in large terminal panicles, and bladdery seed-vessels. A desirable ornamental tree, flowering during the summer. North China, 1763.

LABURNUM vulgare.—The Laburnum in its several forms is a universally admired European tree, bearing a profusion of drooping racemes of yellow flowers in May. *Parkerii* and *Watereri* have much longer racemes and

deeper-yellow flowers than the type; *quercifolium* has curiously lobed leaflets. *Alpinum*, the Scotch Laburnum, flowers a few weeks later, and has larger blossoms than the type.

LAFAGERIA rosea.—A handsome climbing shrub, with 5-nerved leaves, and large bell-shaped fleshy flowers of a deep rosy-red or white, keeping fresh for a long time after being cut. On walls and trellises in the south-west it is hardy, as it bears a few degrees of frost with impunity. Patagonia, 1847.

LARDIZABALA bitermata.—A tall rapid-growing climber, with glossy, dark-green, twice-ternate leaves, and purplish flowers in drooping racemes, appearing in December and January. It flourishes only in the milder parts of the kingdom. Chili, 1848.

LAURUS Benzoin.—A shrub from 8 to 10 feet high, with large oblong leaves, and minute clustered greenish-yellow flowers appearing before the leaves. Requires a moist shady situation in the south or west, and peaty soil. Virginia, 1688.

L. nobilis, Sweet Bay.—This, although attaining the dimensions of a tree of considerable size in favourable situations, is usually seen as a shrub. Except in low situations on cold stiff soils, it is hardy throughout Britain, and on gravelly or sandy soils it forms one of our most ornamental evergreens. 1562.

L. Sassafras.—A tree from 40 to 50 feet high, with entire or three-lobed leaves, which change to a brilliant red and yellow in autumn. Flowers small, greenish-yellow, slightly fragrant. North America, 1633.

LAVANDULA.—Several species of lavender are hardy, and deserving of a place in the shrubbery or flower-garden on account of their agreeable fragrance. They delight in a deep free soil, and flourish well near the sea. *Spica* and *vera* are the hardiest, but *dentata* will succeed in the milder parts of the south-west. All have blue or lilac flowers, and are natives of the Mediterranean region.

LEDUM.—Dwarf shrubs 2 to 3 feet high, with evergreen curled leaves of a reddish-brown colour beneath, and terminal clusters of small white or pinkish flowers, produced in April and May.

L. latifolium.—This has oval or oblong leaves, slightly curled at the margin, and very numerous pink flowers. North America, 1763.

L. palustre.—Similar to the last, but of less robust habit, and having narrower, revolute, distant leaves. There are several varieties. North America and Northern Europe, 1762.

LESPEDEZA bicolor.—A dwarf shrub, with trifoliolate deep-green leaves, and purple papilionaceous flowers produced in long panicles in autumn. China and Japan.

LEUCOTHÖE.—One of the generic groups divided from *Andromeda*.

L. Catesbei.—An evergreen, diffuse, spreading shrub, with simple toothed leaves, and axillary bracteate racemes of white flowers in May or June. There are several varieties. North America, 1765.

L. racemosa (*Andromeda racemosa*).—An ornamental deciduous shrub 3 to 4 feet high, bearing a profusion of terminal clustered spikes of white fragrant flowers in June or July. North America, 1736.

LEYCESTERIA formosa.—A tall-growing shrub of distinct appearance. It has hollow stems and flaccid lanceolate leaves. The small white flowers are borne in whorls, gradually diminishing in size towards the tip of the raceme, and are subtended by foliaceous purple bracts. It requires a warm sheltered situation or a wall north of London. Northern India, 1824.

LIGUSTRUM.—Some of the Privets are ornamental shrubs, having panicles of white fragrant flowers almost as large as those of the Lilac. The eastern species thrive best in warm situations on a light soil.

L. coriaceum (fig. 375).—A distinct little shrub of compact habit, with stout branches, and thick glossy dark-green coriaceous ovate-oblong leaves. Japan, 1864.



Fig. 375.—*Ligustrum coriaceum* (4.)

L. Itoha.—There are two varieties of this in cultivation, one of which is worthless. The other, however, is a very pretty shrub, with large panicles of white flowers. Japan.

L. japonicum.—This is a suitable shrub for planting near the sea. It has broad smooth leaves, and large panicles of fragrant flowers in summer. There is a handsome variegated form. Japan, 1845.

L. lucidum.—In favourable localities this becomes a tree over 20 feet high. It is evergreen, and its large glossy leaves are handsome. The white flowers appear in large erect panicles in August. China, 1794.

L. ovalifolium is useful for hedge-making, retaining more foliage in winter than *L. vulgare*. The

golden form is by far the best of all the variegated Privets. Japan.

L. sinense is sub-evergreen, and produces an abundance of feathery racemes in summer, followed by clusters of black-purple fruits. It thrives best when planted where shelter is afforded by other trees. China, 1874.

L. vulgare.—The variety of the common Privet called *sempervirens* or *italicum* is almost truly evergreen, and very desirable for shrubberies, hedges, &c., as it will flourish on very poor light soils.

LINNÆA borealis.—A slender creeping shrub, with small opposite leaves, and small bell-shaped pink flowers borne in pairs on long erect stalks. An elegant little plant, rising only a few inches from the soil, indigenous in pine woods in Scotland, &c., and thriving best in a shady situation. It flowers in summer.

LIPPIA citriodora (*Aloysia citriodora*), Lemon-scented Verbena.—This favourite agreeably-scented shrub succeeds very well in the south-west, or against a wall in less favourable localities. Chili, 1784.

LIQUIDAMBAR.—Elegant, small, aromatic trees of pyramidal outline, resembling the Maples in their leaves, which, however, are alternate and not opposite. Flowers inconspicuous.

L. imberbe (*L. orientalis*).—Rather smaller and more tender than the following, with the central division of the leaf usually three-lobed. Levant, 1759.

L. styraciflua.—This is the species commonly seen. The leaves assume very brilliant tints in autumn. North America, 1681.

LIRIODENDRON tulipifera, Tulip Tree.—This handsome

tree is readily known by its saddle-shaped leaves, and tulip-like yellow flowers borne singly at the ends of the branches in June or July. It attains a height of 150 feet in its native country, North America, and as much as 100 feet in England, where it grows very fast. 1688.

LOISELEURIA procumbens (*Chamaedon*).—A small trailing evergreen, with small leathery leaves, and clustered red flowers in May or June. Native of the mountains of Scotland, &c.

LONICERA.—About eighty species of *Lonicera* are known, these being natives of the temperate and sub-tropical regions of the Northern Hemisphere. The genus includes many beautiful plants, evergreen and deciduous, shrubby and climbing, amongst the latter of which the common Honeysuckle of our hedges occupies a foremost place. The climbing species are used for covering porches and walls near windows.

L. brachypoda.—Evergreen, with oval or oblong shining leaves, and pale-yellow sweet-scented flowers, borne in pairs, its flowering season being of long duration. The variety *aureo-reticulata* has leaves netted with yellow. *L. japonica* (*sinensis*) is a variety of this species. In severe winters it is sometimes cut down to the ground by frost, even when planted against a wall.

L. Caprifolium resembles the common Honeysuckle, but the flowers are seated close upon the upper connate leaves. It blooms in summer. Southern Europe.



Fig. 376.—*Lonicera flava*. (1.)

L. flava (fig. 376).—A yellow-flowered tender species from North America, introduced in 1810. The flowers are large and very fragrant.

L. flexuosa.—A handsome species with long lanceolate leaves, hairy and purplish below when young; flowers pink and yellow, borne in pairs, very fragrant, appearing in summer. Japan, 1804.

L. fragrantissima.—A deciduous shrub, with small, white, highly odoriferous flowers in February. In mild localities it retains some of its foliage through the winter. China, 1845.

L. Periclymenum, Honeysuckle.—A beautiful garden plant, surpassing many of the exotic species. There are several varieties, viz. the Dutch Honeysuckle, *L. belgica*,

very commonly grown; *L. serotina*, the late red of the nurseries; and *L. quercifolia* with lobed leaves, similar to those of the Oak.

L. sempervirens, Evergreen or Trumpet Honeysuckle.—This is not strictly evergreen though it bears the name. It has glaucous stem-clasping leaves, and terminal clusters of showy flowers, scarlet outside and yellow within, produced in profusion throughout the summer if planted in a light rich soil in an open sunny situation. There are several varieties. North America, 1656.

L. Standishii.—Very near *L. fragrantissima*, but the leaves are larger and more ovate, and the plant is generally deciduous. Flowers pinkish-white, fragrant, and produced in winter and spring. China, 1860.

L. tatarica.—A shrub from 4 to 8 feet high; leaves small, heart-shaped. There are pink, yellow, white, and purple flowered varieties, and others with striped flowers. Tartary, &c., 1752.

L. tomentella.—A shrub of graceful and luxuriant habit, 6 to 10 feet high in favourable situations. Leaves downy and white beneath; flowers white. Himalaya, 1849.

L. Xylosteum.—This creamy-yellow flowered species is a handsome shrub, and is quite hardy. There are varieties with white, yellow, crimson, and black berries. Europe.

LOBOPETALUM chinense.—A curious and tender but pretty shrub, allied to the Witch-hazels. It has dark-green, alternate, oblong leaves, and white flowers borne in terminal heads in spring; the four petals are narrow and strap-shaped. China, 1880.

LYCIUM.—Rambling shrubs, with small narrow leaves, and tubular purple-violet or red flowers. The branches are long and slender, and more or less armed with small thorns.

L. chinense (*L. barbarum*), Tea-tree.—This has violet-red flowers and a scarlet fruit, and is a rapid-growing bushy climber, thriving in almost any situation, and bearing the smoke of towns and the sea-breezes with equal impunity. Its flowers, although not large and showy, are numerous, and are produced all through the summer. Southern Europe, 1730.

L. pallidum.—A distinct and handsome shrub about 4 feet high, bearing large, greenish, tubular flowers in May and June. New Mexico and Arizona.

LYONIA ferruginea.—An evergreen shrub from 3 to 6 feet high, with coriaceous obovate leaves borne on long stalks and clothed with brown scales. Flowers small, rusty-white, produced in summer. Not hardy in the colder parts of Britain. North America, 1774.

MAELURA aurantiaca, Osage Orange.—A dioecious tree of the Mulberry family, growing about 20 feet high in the south of England. It has deep-green, shining leaves, and the branches are armed with stout spines. The large handsome orange-coloured fruits are rarely produced in this country. North America, 1818.

MAGNOLIA.—Most of the twenty species of *Magnolia* known to botanists have been introduced into European gardens. They vary in stature from tall trees over 100 feet high to dwarf bushes. The largest trees are natives of North America, the smaller, and, as a rule, more floriferous ones coming from China and Japan. The flowers are frequently very strongly perfumed. *Magnolias* should be planted in deep, moderately rich, loamy soil. Some require the shelter of a wall in the more inclement parts of the country. They are amongst the worst of all trees to transplant.

M. acuminata, Cucumber Tree.—This reaches a height of 60 to 80 feet. Leaves pointed, from 6 to 12 inches long. One of the hardiest. North America, 1736.

M. Campbellii.—An arborescent deciduous species, with brilliant crimson and white flowers nearly as large as those of *M. grandiflora*. It is still rare in gardens, and has only flowered up to the present in the south of Ireland. It is probably only adapted for that and similar localities. Northern India, 1868.

M. conspicua (*M. Yulan*).—This forms a moderate-sized tree or large shrub. It produces a profusion of large



Fig. 377.—*Magnolia soulangeana*.

white fragrant flowers in early spring, or even as early as February in mild seasons, before the appearance of the leaves. There are several varieties or hybrids between it and *M. purpurea*. One of these, *M. soulangeana* (fig. 377), has the petals tinged with purple; another, *M. Lennei*, flowers in May, and has the outside of the petals a rich glowing purple. China, 1789.

M. Fraseri (*M. auriculata*).—A large tree with leaves about 1 foot long and 6 inches wide, the base lengthening out at each side of the petiole into two prominent lobes. Flowers creamy white. North America, 1786.

M. glauca.—An evergreen in the milder parts of the kingdom, where it attains as much as 20 feet in height. It has relatively small obovate or elliptical leaves, glaucous beneath, and white fragrant flowers 2 to 3 inches in diameter, appearing in May or June. There are several varieties, including *Thompsoniana* (fig. 378), *longifolia*, &c. North America, 1688.

M. grandiflora.—A handsome evergreen bush or small tree with shining entire leaves 6 to 12 inches long, and delicious lemon-scented white flowers nearly as much in diameter, produced from May or June till late in autumn. There are several varieties in cultivation: *obovata*, *exoniensis*, *præcox*, and *angustifolia* are among the best. North America, 1734.

M. hypoleuca.—A large tree, with leaves a foot long by 7 or 8 inches wide; the flowers 6 inches across, creamy-white and delightfully perfumed. Japan.

M. macrophylla.—Leaves 2 to 3 feet long, auricled at the base. Flowers white, with a purple spot, fragrant. Tender when young. North America, 1800.

M. obovata.—This seldom exceeds 5 or 6 feet in height. It has large obovate dark-green leaves, and large fragrant flowers, purple on the outside and white within, which appear in April and May. The variety *discolor* (known also as *M. purpurea*) has larger and more conspicuously purple flowers. Japan, 1790.

M. parviflora.—A new Japanese species of free growth. It produces its flowers at intervals during the summer, these being cup-shaped, white, 3 inches across, with a cluster of rosy-crimson stamens. Allied to, but quite distinct from, *M. Watsoni*.

M. stellata (*M. Halleana*).—A dwarf deciduous shrub rarely more than 5 feet high in Britain. It flowers earlier in spring than *M. conspicua*, the starry flowers being pure-white on first opening, afterwards tinged with rose. The petals number twelve or fifteen, and are strap-shaped. Japan, about 1863.

M. tripetala (*M. Umbrella*).—About 20 to 30 feet high, with lanceolate leaves a foot long, and large white, unpleasantly-smelling flowers. North America, 1752.

M. Watsoni.—A beautiful shrubby species, with elliptical or oblong leaves 4 to 7 inches long and half as much wide. The flower is 5 to 6 inches across, the petals ivory-white, the outer ones flushed with rose; there is a ring of crimson filaments in the centre. Japan, 1889.

MENISPERMUM canadense, Moonseed.—A tall-growing ornamental climber, with large heart-shaped or kidney-shaped peltate leaves, and panicles of small yellowish-green flowers, succeeded by clusters of black berries resembling small grapes. This hardy climber deserves to be more widely known than it is at present. It should be noted that the male and female flowers are borne on different plants. North America, 1713, or before.

MENZIESIA.—In nurseries several widely different plants are grown as species of this genus: for instance, *Daboecia polifolia*, described above; and *Phyllodoce caerulea*, a very rare Scotch trailing shrub, with small glossy coriaceous leaves, and terminal clusters of lilac-blue flowers.

M. globularis and its varieties are North American deciduous shrubs from 3 to 4 feet high, with yellowish-brown flowers. These and some of the other small-flowered shrubs of this class, not specially recommended, scarcely



Fig. 378.—*Magnolia glauca Thompsoniana*. (i.)

merit growing for any ornamental qualities they possess, but where a varied collection is the object they might be admitted.

MESPILUS lobata (*M. Smithii*, *M. grandiflora*).—A very ornamental small round-headed tree 15 to 20 feet high, with large white, solitary flowers in May or June. It is

believed to be of hybrid origin. *M. domestica* (*Pyrus germanica*) is the Quince.

MORUS.—From the peculiar dwarf spreading habit of some members of this genus they are worth planting for ornamental purposes alone.

M. alba.—Very similar to the common Mulberry, but has slenderer, white-barked branches. The varieties are numerous, but not often met with in this country. The silkworm is fed on its leaves. China, 1596.

M. nigra, Common Mulberry.—A round-headed tree of slow growth, with deep-green cordate leaves. Western Asia, 1548.

M. rubra.—A much taller-growing species, 50 to 70 feet, of peculiar habit; leaves rough on both surfaces. It is impatient of transplantation, but of rapid growth when well established. North America, 1629.

MUEHLENBERGIA complexa.—A climbing plant with very thin wiry stems, forming a dense interlacing mass. The leaves are small and roundish. Only hardy in the south. New Zealand, 1870.

MUTISIA.—A large genus of climbers belonging to the *Compositæ*, of which some of the Chilian species are hardy in the south-west and Ireland. They have pinnate or lobed leaves terminating in a tendril, and very showy flower-heads.

MYRICA.—Small aromatic shrubs, usually covered with resinous glands. Flowers inconspicuous. They inhabit wet peaty places.

M. cerifera, Wax-Myrtle.—Very near the Sweet-Gale, but it is evergreen. North America, 1699. The variety *latifolia* is described as being hardier than the type.

M. Gale, Sweet-Gale.—This fragrant-leaved shrub deserves planting in boggy places, and on the margins of lakes.

MYRTUS.—The Myrtle, *M. communis*, can only be grown in the open in the south-west; in all other parts it requires the shelter of a wall, and during severe weather additional protection. But it well merits the little care necessary to preserve it. Europe, 1597.

NEILLIA.—This genus is nearly allied to *Spiræa*, a name by which some of the following species are known in gardens.

N. amurensis.—A shrub 6 or 7 feet high, with three- to five-lobed leaves, the panicles of white flowers being produced in summer. Amurland.

N. opulifolia.—The strongest growing of the Neillias, attaining a height of 10 feet. The flowers are white and borne in umbels. The leaves are like those of the Guelder Rose. Var. *aurea* has leaves of a bright-yellow in the early part of the year. North America, 1690. Besides the above, *N. Torreyi*, California, and *N. thyrsiflora*, Himalaya, are in cultivation.

NEVIUSIA alabamensis is a small shrub with alternate glabrous leaves 2 to 3 inches long. The flowers are very numerous, about 1 inch across, the chief feature being the large cluster of white stamens. Requires a sunny position. Alabama, 1882.

NOTASPARTIUM Carmichaeliæ.—A singular plant with rounded or flattened branches carrying a few small leaves. The flowers are pea-like, small but very abundant, and pink. Hardy only in the south. New Zealand, 1883.

NUTTALLIA cerasiformis.—One of the earliest of spring-flowering shrubs. Flowers dull white, in drooping racemes like a Currant. A spreading bush 5 feet high. California, 1848.

NYSSA.—A North American genus of handsome trees belonging to the Dogwood family, with small flowers in dense heads, and simple alternate leaves. *N. sylvatica*

and *N. aquatica* are occasionally seen in this country. In North America they bear the names of Tupelo, Pepperidge, Sour Gum Tree, &c. 1824.

OLEARIA.—A genus of shrubby evergreen composites, of which one species—*O. Haastii*—is hardy as far north as the midland counties of England. The rest are rather tender, and are only suited for the south and west.

O. dentata, *Gunniana*, and others require protection except in the districts mentioned above.

O. Haastii (fig. 379).—A compact, slow-growing shrub



Fig. 379.—*Olearia Haastii*. (4.)

rarely more than 5 feet high, with small elliptical leaves about 1 inch long, dull-green above, white beneath. The small, numerous flowers appear in August and are white. A very free-blooming, useful shrub. New Zealand.

ONONIS arragonensis.—A dwarf shrub suitable for a rockery, being from 1 to 2 feet high. The leaves are trifoliate, the flowers yellow, in short racemes produced in great profusion in May and June. Spain, 1816.

OSMANTHUS Aquifolium.—In foliage this resembles the Holly, but the leaves are smaller and opposite. The flowers are small, fragrant, and greenish-white. There are varieties with white and yellow variegation, one with purplish foliage which is the hardiest, a dwarf one called *rotundifolius*, and one with Myrtle-like leaves, *myrtifolius*. Japan.

OSTRYA vulgaris, Hop-Hornbeam.—Very near the common Hornbeam in foliage, but of more pendulous habit. It is very ornamental when laden with its drooping Hop-like, female catkins. Italy, 1720. *O. virginica* closely resembles this, except that its female catkins are erect. North America, 1692.

OXYCOCUS palustris, Cranberry.—This native evergreen trailer is attractive when in flower, and only inferior to the North American species, *O. macrocarpus*, in size. The petals are pink and reflexed, the filaments purple, and the anthers yellow, thus forming a very pretty combination of colours.

OXYDENDRON arboreum (*Andromeda arborea*).—A handsome deciduous tree, bearing large terminal panicles of white flowers in August; these look like branched spikes of Lily-of-the-Valley bells. This ornamental tree is very rare in British gardens, although there are specimens

20 feet high in the Knap Hill Nursery. North America, 1752.

OZOTHAMNUS rosmarinifolius, Snow in Summer (fig. 380).—A shrubby Composite with long arching branches clothed with small Rosemary-like leaves, and bearing in summer dense clusters of white Daisy-like flowers. Requires the protection of a wall, except in the south and west. Tasmania.

PÆONIA Moutan.—This, the Moutan or Tree Pæony, is one of the showiest of spring or early-summer flowering shrubs. The greatest drawback to its cultivation in Britain is its liability to damage by spring frosts, and it frequently succeeds better in cold districts, where it starts

late into growth, than in warmer localities. It makes a rounded bush 5 feet or more high, thriving best in a rich loam. In the type plant the flowers are pink, but in the numerous varieties the colours vary from pure-white to rich-purple. China, 1787.

PALURUS aculeatus, Christ's Thorn.—A dwarfish, densely-branched, spiny shrub, with three-nerved leaves, greenish-yellow flowers, and curious orbicular winged seed-vessels. Palestine, &c., 1596.

PARROTIA Jacquemontiana is a hazel-like small tree, remarkable for the large white bracts which surround the flowers, but is not so useful as the other. Kashmir.

P. persica.—A handsome, hardy, small tree, still rare in gardens. Its yellowish flowers are not particularly showy, but its oblong simple leaves are very striking when they assume their brilliant autumnal tints of orange and scarlet. Northern Persia, 1848.

PASSIFLORA corulea.—The Passion-flower is

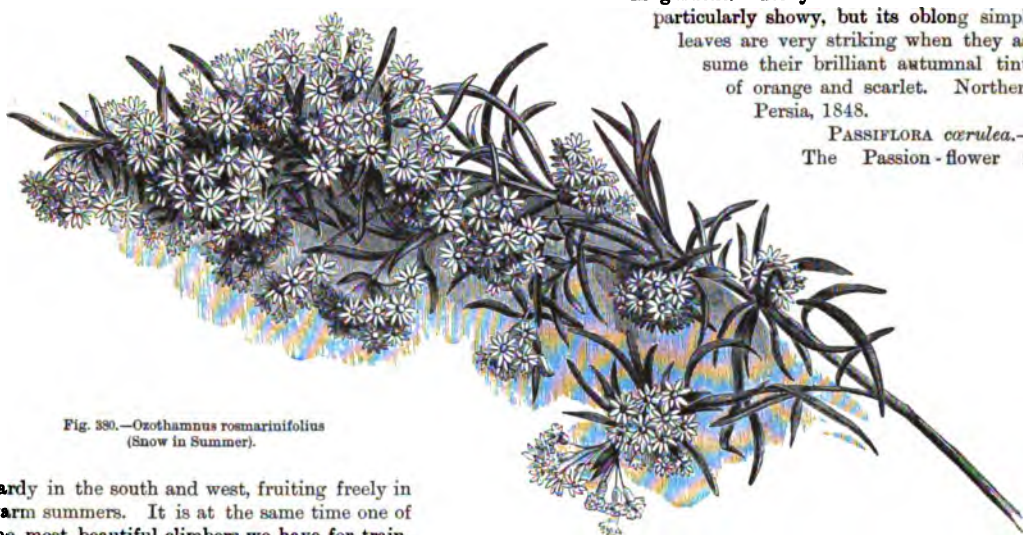


Fig. 380.—*Ozothamnus rosmarinifolius*
(Snow in Summer).

hardy in the south and west, fruiting freely in warm summers. It is at the same time one of the most beautiful climbers we have for training up house-fronts, &c. The young wood may be cut back annually after the flowering season is over. There are, besides the typical form, several varieties, and two or three hybrids nearly as hardy. The variety *Constance Elliot* is a charming climber, with white, fragrant flowers. Uruguay, South America, 1899.

PAULOWNIA imperialis.—A distinct deciduous tree about 40 feet high, with very large cordate leaves, and terminal panicles of purplish-violet, spotted, fragrant flowers, which rarely expand in this country, as they are formed in the autumn, and are usually injured by the winter frosts. It is rather tender for most situations, especially when young. It is sometimes grown as a fine-foliage plant in beds, each plant being restricted to a single stem and cut back to the ground every winter. Thus treated its leaves are as much as a yard long. Japan, 1840.

PERIPLOCA græca.—A perfectly hardy tall twining shrub, with simple lanceolate leaves, and long-stalked clusters of brown and green hairy flowers of unpleasant odour. It is a handsome shrub, useful to clothe a wall or other place where its foetid smell is not likely to offend. It flowers in July and August. South Europe, 1597.

PERNETTYA.—An American genus of dwarf evergreen shrubs, with small dark-green rigid leaves and white flowers, succeeded by berries of various colours, which are very ornamental in winter. They thrive best in a peat soil or light loam, and flourish in the neighbourhood of the sea.

P. mucronata.—The species most commonly seen in gardens, the others differing from it only in minor details.

It is a bush from 3 to 4 feet high, the round berries ranging in colour from pure-white to deep-red. Strait of Magellan, 1828.

PERSICA Davidiana.—The earliest to flower of the Peach and Almond groups, being frequently in bloom in February. It is a small tree with narrow serrated leaves and white or rosy flowers. China.

P. vulgaris (*Amygdalus Persica*), the Peach.—This, the type from which the well-known fruit-tree has been derived, has many beautiful varieties, some having flowers red or white, single or double, others with purple or variegated leaves. Eastern Asia, 1562.

PHILADELPHUS (the *Syringa* of gardeners).—Handsome shrubs, with simple leaves, and showy, white, highly odoriferous flowers. They will succeed in almost any soil.

P. coronarius, Mock-Orange.—An erect-growing species from 6 to 12 feet high. Flowers scarcely so large as in some of the following, but appearing earlier in May. There is a yellow-leaved variety, and also one with double flowers. South of Europe, 1596.

P. Gordonianus.—An American species, with flowers nearly double the size of the foregoing, and not appearing before the end of June or beginning of July. 1823.

P. inodorus.—This has large scentless flowers and quite entire leaves; it has been in cultivation since 1738, and is a native of North America.

P. latifolius, including *speciosus*, *grandiflorus*, &c.—Leaves hairy when young. Flowers large, very sweet-scented, appearing in June or July. North America, introduced about 1800.

P. Lemoinei (fig. 381).—A charming hybrid between *P. coronarius* and *P. microphyllus*. Its flowers and leaves are intermediate in size. This and its varieties *Gerbe de Neige* and *Boule d'Argent* are beautiful hardy shrubs.



Fig. 381.—*Philadelphus Lemoinei*. (½.)

Immediately after flowering, the shoots should be cut out to the base.

P. microphyllus.—A dwarf species quite distinct from any other. Leaves $\frac{1}{2}$ inch to $\frac{3}{4}$ inch long; branches thin and wiry; flowers very fragrant, $\frac{3}{4}$ inch across. New Mexico, 1883.

P. Satsumi.—A species of graceful, spreading habit, with long narrow leaves. Japan, 1851.

PHILLYREA.—Handsome bushy evergreen shrubs, with small undivided opposite leaves, and inconspicuous fragrant flowers, produced in early spring. There are many varieties intermediate between the following principal forms. Natives of the south of Europe, thriving in any ordinary soil and near the sea.

P. angustifolia.—This has narrow, quite entire leaves, and grows from 8 to 10 feet high. Introduced in 1597.

P. latifolia.—Of larger stature than the preceding, with ovate toothed leaves. 1597.

P. media.—Leaves sharp-pointed, slightly-toothed, lanceolate-acuminate. This is the species best known in British gardens. 1597.

P. Vilmoriniana (*P. decora*).—The handsomest and most useful of Phillyreas. It has large, stiff, very dark green leaves, and white flowers produced abundantly in axillary clusters. For the sake of quick propagation it has been largely grafted on the Privet. Such plants should be avoided as they are short-lived, especially as it strikes readily from cuttings. Asia Minor, 1885.

PHLOMIS fruticosa, Jerusalem Sage.—A tender shrub of the *Salvia* family growing 4 or 5 feet high. It has oblong-lanceolate toothed leaves, clothed with a yellowish down. The flowers are yellow, in large axillary clusters, in June or July. Southern Europe.

PHOTINIA.—Handsome shrubs with coriaceous leaves, and terminal panicles or corymbs of small white flowers

produced in summer. Not suitable for stiff soils in low situations.

P. serrulata (*Crataegus glabra*).—This has Laurel-like leaves, and attains a height of 15 feet in Britain. China and Japan, 1804.

PHYLLOSTACHYS.—Some of the hardiest and handsomest of hardy Bamboos belong to this genus, which is readily distinguished from *Arundinaria* by the following characters:—1. the branches develop from the bottom of the stem upwards; 2. one side of the stem above each group of branches is flattened or channelled; 3. the stems are more or less zigzag, especially towards the top; 4. the branches are rarely more than two or three in number at each joint. For culture see **BAMBUSA**.

All the following species are commonly called *Bambusa* in gardens.

P. aurea (fig. 382).—Stems somewhat erect, attaining in this country a height of 14 feet. The nodes at the base of the stem are much crowded. Leaves usually about 4 inches long. Distinct from all other species in having a flat, raised band $\frac{1}{4}$ to $\frac{1}{2}$ inch wide just beneath each node. Japan.

P. Boryana.—Allied to *P. nigra*. It is a very vigorous and graceful Bamboo, and undoubtedly one of the best and hardiest. The foliage is dark-green and luxuriant. Japan, 1892.

P. Castillonis.—Although not so hardy as some, this is one of the most striking. It is 8 feet high (probably more eventually), with leaves striped with yellowish-white. Stems bright-yellow, except where a broad green stripe

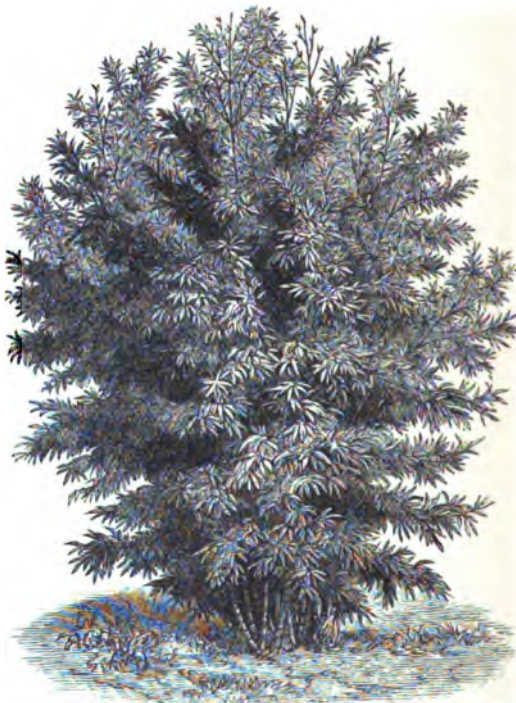


Fig. 382.—*Phyllostachys aurea*.

extends from one joint to another, on opposite sides alternately. Japan, 1892.

P. flexuosa.—Similar to *P. viridi-glaucescens*, but smaller in every respect—in leaf, in stature, and size of stem. It is about 6 to 8 feet high, spreading and graceful in habit.

It flowered in France and Algeria in 1876. China, 1864.

P. Henonis.—Stems 14 feet high, gracefully arched, with luxuriant wavy leafage. One of the most elegant. Japan.

P. Marliacea.—Similar to *P. Quiloi* in leaf and other characters, but it can at once be distinguished by the well-marked wrinkling of the stems. Japan.

P. mitis.—The most robust of all our hardy Bamboos. Stems have been produced in Britain 20 feet in height and 4½ inches in circumference. Leaves as in *P. aurea*. China and Japan.

P. nigra.—This owes its name to the stems turning almost black the second year. It reaches a height of 10 feet in the south of England, and is one of the most graceful species. Var. *nigro-punctata* is a somewhat stronger grower, and differs in the stems being mottled.

P. Quiloi (*P. Mazeli*).—A vigorous-growing Bamboo, with dark-green stems 20 feet in height. It resembles *P. mitis*. Japan, 1866.

P. ruscifolia (*P. Kumasaqa*).—The smallest of the genus. The slender stems are very much zigzagged and about 2½ feet high. Leaves 3 to 4 inches long and an inch wide, downy on the lower surface. Japan.

P. sulphurea.—Stems of a beautiful clear-yellow, 18 feet high; similar in foliage to *P. mitis*. Japan, 1866.

P. viridi-glaucescens.—One of the most desirable of all hardy Bamboos, uniting perfect hardiness with exceptional gracefulness. It is 14 to 18 feet high, with the outer stems arching outwards so that their tips touch the ground. China and Japan, 1846.

PIERIS.—The four following, as well as several other American plants, will be found in different catalogues and books under the genera *Andromeda*, *Leucothoe*, and *Lyonia*.

P. floribunda.—A compact, dwarf-growing, hardy evergreen, from 2 to 3 feet high, with ovate finely-toothed and ciliated leaves, and terminal clustered spikes of white flowers in April and May. One of the most attractive of spring-flowering shrubs. North America, 1812.

P. formosa.—Although occasionally injured by frost as far north as London this in the south-west is a very beautiful evergreen shrub. It has dark-green, leathery, finely-toothed leaves, and terminal compound racemes of porcelain-white flowers. North India.

P. japonica.—A much hardier evergreen species than the preceding, flowering in early spring. It has stout, dark-green, lanceolate leaves, the white flowers being arranged in pendulous racemes. Japan.

P. mariana.—A deciduous shrub from 2 to 3 feet high; leaves oval, entire; flowers rather large for the group, white tinged with red, borne in large clusters on nearly leafless branches all through the summer. North America, 1736.

PIPTANTHUS *nepalensis*.—A leguminiferous shrub, with large trifoliate leaves; flowers yellow, in terminal racemes. In most parts of the country it requires the protection of a wall. North India, 1821.

PITTOSPORUM.—A few species of this genus are sufficiently hardy for the south-west or a wall. They have simple leaves and white fragrant flowers.

P. Tobira is a handsome shrub 8 to 10 feet high, with glossy coriaceous leaves, and terminal clusters of flowers produced throughout the summer. China, 1804.

P. undulatum.—An Australian species; in cultivation since 1789. It has pale-green wavy leaves with a dark-brown midrib, and whitish flowers.

PLAGIANTHUS *Lyalli* (fig. 383).—A beautiful shrub which is quite hardy in the open, but flowers better when planted against a south wall. The leaves are 2 to 4 inches

long, cordate, pointed; the flowers snow-white with golden-yellow anthers, and produced in abundant clusters. New Zealand, 1871. *P. betulinus* and *P. Lampentii* have white and yellowish-white flowers respectively, the latter has

flowered in the British Isles. Both are tender.

PLATANUS.—Planes are unsurpassed by any other trees in grandeur and beauty, and are amongst the best for town planting, where they would succeed even better if occasionally well watered in dry seasons.

P. occidentalis.—A rare tree, what is usually grown under this name being *acerifolia*. It differs from that tree in its more pubescent, coriaceous leaves and in the fruit catkins being solitary. North America, 1836.

P. orientalis.—This is the best of the Planes. It has very widely-spreading



Fig. 383.—*Plagianthus Lyalli*.

branches, and deeply five-lobed leaves. There are several varieties or, according to some authorities, allied species, the best known of which is *acerifolia*, the so-called "London Plane", which is of more erect habit, the leaves usually three-lobed; *cuneata* has the base of the leaf wedge-shaped. Western Asia, 1548.

PLATYCRATER *arguta* (*P. Sieboldii*).—A Japanese shrub introduced in 1866, allied to *Philadelphus*, and having similar white flowers.

POLYGALA *Chamaebuxus*.—This little shrub belongs to the same genus as the common Milkwort, but it is larger in all its parts, growing from 6 to 12 inches in height. The flowers are yellow and cream, tipped with purple. It prefers a peaty soil, but will succeed in sandy loam and leaf-mould. Central Europe, 1658.

POLYGONUM *Baldschuanicum*.—A climbing shrub of singular interest and beauty, which can be allowed to ramble over branches of trees stuck in the ground so as to form a pyramid 10 feet or more high. The leaves are small, shining, and of a beautiful green; the flowers are borne in large feathery racemes and are pinkish-white. It is sometimes cut to the ground in hard winters, but springs up freely in spring. Turkestan, 1882.

POPULUS.—Fast-growing, lofty trees, valuable for planting in stiff clays and in wet places, where scarcely anything else will succeed, especially *P. nigra*.

P. alba, Abele.—Leaves silvery beneath. Succeeds well on the borders of streams, in which situation it attains 100 feet in height. There are several varieties, differing in the shape of the leaves and the density and colour of the tomentum; one named *Bolleana* is of columnar habit like the Lombardy Poplar. Var. *nivea*, the Aremberg Poplar, is especially noteworthy for the vivid whiteness of its leaves beneath. Europe.

P. balsamifera, Balsam Poplar.—The leaves expand very early, and are of a fine yellow-green; the buds covered with a fragrant resin. Rather subject to canker in some districts, but nevertheless a valuable tree for moist situations. North America, 1692. *P. laurifolia* and *P. suaveolens* are species allied to the Balsam Poplar. *P. candicans* is now considered a variety of it.

P. fastigiata (*P. pyramidalis*), Lombardy Poplar.—This well-known tree, so remarkable for its slender, erect, lofty form, is a variety of *P. nigra*.

P. grandidentata.—Leaves large, coarsely toothed. North America, 1772.

P. monilifera, Necklace Poplar.—This has very long female catkins. Canada, 1769.

P. nigra, Black Italian Poplar.—A rapid-growing tree from 50 to 80 feet high, doing well in most situations. Its leaves expand late.

P. tremula, Aspen.—Both the type and a variety called *pendula* are trees of elegant habit.

POTENTILLA fruticosa.—A native undershrub about 3 feet high, with three to five-foliolate leaves, and yellow flowers in July and August, continuing long in blossom. The variety *tenuiloba* is the most ornamental.

P. glabra is a pretty dwarf shrub with smooth leaves and stems, and white flowers. Siberia, 1818.

PRINOS glaber.—An evergreen shrub growing about 4 feet high, with small lanceolate leaves, and white flowers in July or August, succeeded by black berries. North America, 1759.

P. verticillata, Black Alder.—A North American shrub, closely allied to the Holly but deciduous. Leaves hairy, not prickly; flowers small, white, followed by red berries. 1736.

PRUNUS.—This genus includes *Amygdalus* (Almond), *Persica* (Peach), *Cerasus* (Cherry), besides the true Plums; for the purposes of this work we have, as a more convenient arrangement, kept up the older distinctions.

P. cerasifera, Myrobalan Plum.—A small tree, probably a native of the Caucasus. It flowers in April, and its blossoms are white. Var. *atropurpurea*, now widely known as *P. pissardi*, is one of the most valuable of recently-introduced trees. It produces an abundance of delicate rosy flowers in March, followed by the claret-coloured foliage which maintains throughout the summer and autumn a more or less reddish-purple tinge.

P. spinosa, Blackthorn or Sloe.—The double-flowered form of this native tree is very handsome. It flowers at the same time as the wild plant.

P. triloba (*Amygdalopsis Lindleyi*) (fig. 384).—An early spring-flowering shrub, the rosy-white flowers of which are usually partly or wholly double. China, 1857.

Besides the above the following are well worth cultivation:—*P. Mume*, a new introduction from Japan; *P. dasycarpa*; *P. divaricata*, a Caucasian small tree bearing a wealth of white flowers in early April, and allied to the Myrobalan Plum.

PTELEA trifoliata, Hop-tree. A small tree 10 to 15 feet high, with trifoliolate leaves and clustered greenish flowers, followed by winged hop-like seed-vessels. North America, 1704. There are varieties with variegated and golden foliage and fastigiate branches.

PTEBOCARTA caucasica (*P. fraziniifolia*).—A very ornamental tree of moderate dimensions, belonging to the Walnut tribe. It has pinnate leaves, and the small flowers are borne in catkins, succeeded by winged seed-



Fig. 385.—*Pyrus arbutifolia*. (3.)

vessels. In low, humid situations, and in a rich soil, it does not sufficiently ripen its wood to withstand the frosts, the tips of the branches being often injured, like those of *Ailantus glandulosa*. Caucasus, 1782.

PTEBOSTRAX.—A genus of shrubs or small trees nearly allied to the *Halesias* but natives of Japan.

P. hispidum.—A handsome species with large cordate leaves and pendulous racemes of small white flowers. 1875. *P. corymbosum* has rose-tinted flowers; the ovate leaves are rounded at the base.

PUNICA Granatum.—The Pomegranate succeeds very well in warm situations in the south and west, but it requires additional protection inland and northward. There are double, scarlet, and striped-flowered varieties. Southern Europe, 1648.

PYRUS.—Small or medium-sized trees and shrubs, some of which are desirable on account of their beautiful masses of blossom, others for the ornamental character of their fruits.

P. arbutifolia, Chokeberry (fig. 385).—This is a semi-shrubby species attaining sometimes a height of 10 feet. Its leaves are oblong and woolly beneath; the flowers are borne in early summer and are white. North America, 1700.

P. Aria, White-Beam Tree.—Leaves divided, densely woolly and silvery beneath; fruit bright-red, very ornamental. Very variable in the lobing of the leaf. Indigenous. This species may be taken as the type of an important section of the genus, characterized by usually large leaves more or less silvery beneath. *P. vestita*, *P. Aria* var. *lutescens*, and *P. lanata* are amongst the best of them.

P. Aucuparia, Mountain Ash or Rowan-tree.—A good tree for exposed situations. It has pinnate leaves, and its bright-red bunches of fruit are very striking. Indigenous. There are pendulous and variegated forms, also



Fig. 384.—*Prunus triloba*.

a yellow-fruited variety. *P. americana* is the New World representative of it.

P. baccata, including *P. cerasifera*, Cherry-Crab.—There are several extremely pretty varieties of these miniature Crab-trees, which are very ornamental when in fruit. Northern China, Siberia, &c., 1758. *P. prunifolia*, Siberian Crab, and *P. astracantha* appear to be varieties.

P. coronaria, American Crab.—A very profuse-blooming, fragrant, large-flowered tree, 15 to 20 feet high. Desirable, as it comes into bloom after most spring-flowering trees are over. The variety of *flore-pleno* is still more valuable. 1724.

P. floribunda (*Malus floribunda*) (fig. 386).—One of the most beautiful of early-flowering trees. The flowers when



Fig. 386.—*Pyrus floribunda*.

open are of a pale rosy-red, but the flower-buds are of a brilliant crimson; var. *atrosanguinea* has flowers of a more vivid red, var. *flore-pleno* is frequently known as *P. Parkmanni*. Japan.

P. japonica (*Cydonia*).—In the typical form of this shrub the flowers are rich scarlet, but there are also white and rose-coloured forms. A variety known as "Knap Hill Scarlet" is the richest coloured of the red ones. Japan, 1815.

P. Maulei.—A dwarf shrub allied to *P. japonica*, flowers brick-red, succeeded by numerous fragrant fruits, which are used for preserving. A very pretty shrub. Japan, 1874.

P. nigra.—Very similar to *P. arbutifolia*, but with smooth leaves; flowers also purer white. North America.

P. Schiedekeri is a recent hybrid of which the beautiful *P. floribunda* is one parent. It is more robust and tree-like, making long growths each summer, which are profusely clothed with large rosy-red blossoms in spring.

P. Sorbus (*P. domestica*), True-Service.—Resembles the

Mountain Ash, but the fruit is much larger, brownish, and ovate or pear-shaped. Europe.

P. spectabilis, Chinese Crab.—A beautiful flowering tree 20 to 30 feet high. China, 1780.

P. thianschanica, one of the *Aucuparia* group, is a promising species of recent introduction. It is dwarf and sturdy, with pinnate leaves and terminal corymbs of white flowers. Chinese Tartary.

P. terminalis, Wild Service.—A tree 40 to 50 feet high, resembling the White-Beam, but not woolly.

QUERCUS.—For garden purposes the Oaks may be divided into three groups: 1, deciduous trees; 2, evergreen trees; 3, shrubs. The genus is a very large one, 800 species (some semi-tropical) being known.

1. Deciduous trees:—

Q. Agilops, Valonia Oak.—A small but elegant hardy tree, bearing large acorns. Southern Europe, 1781.

Q. Cerris, Turkey Oak.—A symmetrical and rapid-growing handsome tree of large dimensions. The varieties of it are numerous and widely different, one set, designated *subperennis*, being nearly evergreen. This includes *Lucombeana* and *fulhamensis*. Other varieties are *laciniosa*, with lacerated leaves, and *albo-variegata*, with variegated foliage. Southern Europe, &c., 1735.

Q. coccinea, Scarlet Oak.—A fast-growing, tall tree, of pyramidal outline. Leaves nearly a foot in length, of elegant form, and changing to red-brown in autumn. North America, 1691. A variety called *splendens* is by far the most brilliant in autumn, and retains its leaves longer than the type. Allied to this species are *Q. palustris*, *Q. rubra*, and *Q. tinctoria*, all large and handsome trees from North America.

Q. conferta (*Q. pannonica*).—One of the handsomest of European Oaks; leaves with short stalks, the blade 6 to 8 inches long, deeply lobed. South-eastern Europe.

Q. Robur, British Oak.—The forms of this are *pedunculata* and *sessiliflora*, having stalked or stalkless acorns. One of the most ornamental is *fastigiata*, exactly like the Lombardy Poplar in habit. Among others may be mentioned *pendula*, *variegata*, *heterophylla*, *filicifolia*, and *picta*, sufficiently characterized by their names. *Concordia*, the Golden Oak, is also an ornamental plant; *nigra purpurea* is a form with purple leaves.

Other species noteworthy for their large leaves are *Q. Mirbeckii*, Portugal, and *Q. Daimio*, Japan.

2. Evergreen trees:—

Q. Ilex, Holm Oak.—A very variable species, scarcely two trees being exactly alike in foliage. A valuable evergreen for the south and west, and for the sea-coast. It reaches a height of 20 to 40 feet, but assumes a more shrubby habit in the colder parts of the kingdom. Introduced very early from the Mediterranean region.

Q. Suber, Cork Oak.—Also very variable, and resembling some forms of the last species, but scarcely so hardy, though trees of considerable size exist in the south of England. Mediterranean region, 1699.

3. Evergreen shrubs:—

Q. acuta.—A handsome species with sharply-pointed, bright-green leaves 3 to 5 inches long. One form has white veins, another red. Japan, where it probably attains the dimensions of a small tree. Several other species of similar character, equally handsome, and also natives of Japan, need not be separately described. They are *Q. dambusaeifolia*, *Q. cuspidata*, and *Q. glabra*.

Q. coccifera, Kermes Oak.—A small tree in the South of Europe, whence it was introduced in 1683, but shrubby in Britain. Leaves small, elliptical, usually armed with spiny teeth.

RAPHIOLEPIS japonica.—This has flowers which are pure white, fragrant, about $\frac{1}{2}$ inch across, and are produced in erect panicles. The leaves are shining green and obovate. Only hardy in the south. Japan, 1865.

RHAMNUS Alaternus.—In general appearance this evergreen resembles a *Phillyrea*, but the leaves are alternate and variable in form. Nurserymen distinguish several forms, as *latifolius* and *angustifolius*, and varieties with white or yellow variegation. Succeeds well in all except heavy wet soils, growing to a height of 20 feet or more. Southern Europe, 1629.

RHODODENDRON (see also *Azalea*).—With few exceptions evergreen trees or shrubs. The leaves are alternate, entire, often felted or scaly beneath. The flowers are usually large, brilliantly coloured, and produced in great abundance. Most of the varieties in cultivation have been bred in gardens from species from North America, Asia Minor, and the mountains of India. There are also many other species grown in collections, including the "Roses of the Alps", and several from Siberia, China, and Japan. Some of those from the latter region are nearly or quite deciduous, and have small solitary flowers, or two or three together, resembling the *Azaleas*—*R. dauricum*, for example. In South Wales, Cornwall, and similarly favoured localities the Himalayan species thrive in the open air, but even as far to the north only as London, the number is much reduced. The following, however, thrive in sheltered positions:—*campanulatum*, *ciliatum*, *Fortunei*, *glaucum*, *cinnabarinum*, *fulgens*, *niveum*, *Thomsonii*, besides hybrids raised from these and other species. The newest additions are from Western China.

R. arboreum (fig. 387).—A handsome tree, not hardy except in the south-western part of the kingdom. It



Fig. 387.—*Rhododendron arboreum*.

forms a tree from 25 to 40 feet high, and presents several fine natural varieties, differing in the colour of their flowers. The type has rich scarlet flowers, spotted with black inside, and leaves clothed with silvery scales on the lower surface. *Campbellii*, *cinnamomeum*, *nilagiracum*, and others are usually regarded as varieties. The hybrids flower in April and May, or even earlier; *altadarensis*, a

hybrid between *R. arboreum* and *R. catawbiense*, flowers as a rule in January; hence it is liable to be injured by late frosts and a sheltered, partly shaded situation should be selected for it. The popular garden varieties are dealt with elsewhere.

R. campanulatum.—A shrub 4 to 6 feet high, the leaves covered with a fawn-coloured powder beneath; the large flowers are mauve or white, spotted with purple at the base of the three upper lobes. Also an early-flowering species, of which there are several varieties. Himalaya, 1825.

R. catawbiense.—A hardy species from 4 to 6 feet high, with stout branches and deflexed leaves. The flowers are borne in compact clusters and are either pink or rose, tinged and spotted with violet. Numerous hybrids have been raised from it which flower in summer when there is no danger of their being injured by frost. North America, 1809.

R. caucasicum.—A dwarf hardy species, rarely exceeding 3 feet in height. The flowers are white within, rosy-pink outside, and spotted with green in the throat. The varieties *stramineum*, pale yellow; *pulcherrimum*, rose; *album*, white; *picum*, delicate pink with dark spots, are among the best. Caucasus, 1803.

R. ciliatum.—A compact, shrubby, small-leaved species, clothed with rough hairs. Flowers large, delicate rosy-pink and white, appearing in early spring, and thus liable to be destroyed by late frosts. North India, 1850.

R. dauricum.—Two forms of this are grown, one deciduous, the other evergreen. The latter, which is known as *atrovirens*, is the best. Flowers bright rosy-purple, sometimes open in January. Siberia, 1780.

R. ferrugineum.—A dwarf compact shrub from 1 to 2 feet high. Leaves small for the genus, covered with rusty scales on the under side. Flowers rosy-red, less than an inch in diameter, appearing from May to July. Alps of Europe, 1752.

R. fulgens.—One of the hardiest of the Sikkim species. Leaves oval, smooth, green above, woolly and brown beneath; the flowers appear in March, and are rich blood-red. 1861.

R. Fortunei.—This differs from most *Rhododendrons* in having fragrant flowers 3 inches across, and in the corolla having usually seven segments. The leaves are smooth, rather pale green. Flowers in May. 8 feet high. China, 1859. Recently this species has been used for hybridizing, and there is every promise of a new and valuable race springing from it.

R. hirsutum.—Similar to *R. ferrugineum*, differing chiefly in its minutely toothed and fringed leaves, which are furnished with resinous dots below. Prefers a chalky soil.

R. kewense.—A beautiful hybrid between *R. Hookeri* and *R. griffithianum*. Its flowers appear in May in loose clusters, and each measures 4 inches or even more across; colour pale-rose. Raised at Kew, 1875.

R. maximum.—A shrub or small tree from 10 to 15 feet high, and perfectly hardy. Flowers in depressed clusters of medium size, rose and white with a pale-yellow blotch, and purple-brown spots on the upper lobe, or wholly white. This has given birth to several seminal varieties, and, in conjunction with other species, to numerous hybrids. North America, 1736.

R. ponticum.—The hardiest of all except *catawbiense*. It is commonly planted in shrubberies, as it will thrive in a great variety of soils. There are hybridized varieties with white, scarlet, pink, and purple-violet flowers, variously spotted with yellow, green, or brown. In

British gardens it attains a height of 8, 10, or even 20 feet in some situations; and fine old specimens, often spreading as much as twice their height, form very striking objects in the pleasure-ground. Asia Minor, 1763.

R. præcox.—A hybrid between *R. ciliatum* and *R. dauricum*, very early flowering, and consequently often cut by frost. Flowers pale-purple.



Fig. 388.—*Rhododendron racemosum*.

R. racemosum (fig. 388) is a new and charming species which rarely grows more than a foot high, and is suitable for a rockery. The flowers are rosy-white and produced from the leaf-axils towards the end of the shoots. China, 1889.

R. Thomsoni.—This occasionally flowers as far north as the Midlands. Leaves rounded oblong, semi-glaucous beneath; flowers in loose trusses, dark blood-red. Sikkim, 1851.

R. yunnanense.—A new Western Chinese species growing 4 feet or so high. It has narrow, lanceolate, lustrous leaves, and flowers of a delicate lilac. 1889.

RHODORA canadensis.—A deciduous shrub 3 feet high, with clusters of purple sweet-scented flowers appearing before the leaves in spring at a season when few other plants are in flower in the American garden. North America, 1767.

RHODOTHAMNUS Chamæcisus.—A pretty dwarf almost prostrate evergreen shrub, with small oblong leaves, toothed and fringed on the margin, and solitary pale-purple flowers, produced in May or June. It grows on limestone rocks. Alps of Europe, 1786.

RHODOTYPUS kerrioides.—A Japanese shrub, remarkably like *Kerria* in appearance, but it has solitary white Rose-like terminal flowers. Introduced about 1866.

RHUS.—Shrubs or low trees, with elegant simple or pinnate leaves, and small flowers, becoming more ornamental when in fruit. Several species are remarkable for their brilliant tints in autumn.

R. cotinoides (fig. 389).—One of the most beautiful of all shrubs for autumn colour, the leaves dying off in crimson and orange shades. It is similar and nearly

allied to *R. Cotinus*, but the leaves are larger and the flowers less densely arranged. North America.

R. Cotinus, Smoke-Tree, or Venetian Sumach.—A desirable hardy shrub 5 to 8 feet high, with simple roundish leaves on long slender stalks, and loosely paniculate flowers. Some of the pedicels or flower-stalks are transformed into white awns, giving the inflorescence a peculiar feathery appearance. Southern Europe, 1656.

R. glabra.—A handsome shrub, with long, pinnate, nearly smooth leaves. The flowers are borne in large terminal panicles, and are succeeded by bright-red berries. North America, 1726. Var. *laciniata* is a handsome cut-leaved variety.

R. Osbeckii.—A handsome shrub in a young state. Leaves pinnate, 2 feet long, with about a score leaflets. The midrib is winged at each side. Also known as *R. semialata Osbeckii*. Japan, 1867.

R. typhina, Stag's-horn Sumach.—A small tree 10 to 20 feet high, with thick woolly shoots, and long pinnate leaves. Fine autumn effects may be obtained by growing it in masses, cutting the shoots back annually nearly to the ground. The foliage assumes a rich red colour in autumn. North America, 1629.

There are several other species in cultivation, some of which, like *R. Toxicodendron* and *R. venenata*, North American species, are poisonous, though their ternate and pinnate foliage is very ornamental. *R. succedanea* and *R. vernicifera* are Japanese species, with pinnate leaves; the former is rather tender.

RIBES.—Ornamental, sometimes spiny shrubs, with small simple leaves, and pendent racemes of white, yellow, or red flowers appearing in early spring. To this genus belong the Gooseberry and the Currants.

R. alpinum.—A close, compact shrub, with small three- to five-lobed leaves and red berries. There are several variegated forms. Britain.

R. aureum.—Leaves glabrous shining, flowers yellow, the small petals being bordered with red. Varieties *præ-*



Fig. 389.—*Rhus cotinoides*.

cox (fragrans) flowers early, and *serotinum* flowers late, *aurantiacum minus* is of dwarfer habit and the flowers are of a deeper yellow; it is the best form. North-Western America, 1812.

R. sanguineum, Flowering Currant.—This familiar shrub has roundish-lobed leaves and clusters of showy red flowers. The variety *atrorubens* has darker-crimson flowers than the ordinary form; those of *atrosanguineum* are still richer coloured; *glutinosum* has pale-rose flowers; *malvaceum* has dark flowers and very rough leaves; *Gordonianum* is a hybrid between *sanguineum* and *aureum*, having reddish flowers tinged with yellow. There is also a white-flowered variety, and another with double flowers. North-Western America, 1826.

R. speciosum (*R. fuchsoides*) (fig. 390).—A spiny shrub, clothed with glandular prickles, and axillary, Fuchsia-like pendent flowers, which are extremely elegant, of a rich crimson colour, and borne in twos or threes. Requires the protection of a south wall in the colder districts. California, 1829.

ROBINIA.—Thorny deciduous trees, with unequally pinnate leaves, and racemose, white, rose, or pink flowers. They are fast-growing, sparsely branched, and shallow-rooting.

R. hispida, Rose Acacia.—A shrub from 4 to 8 feet high. Young branches densely clothed with sharp bristles; leaves pinnate; flowers large, rose-pink, borne in clusters in the summer. Carolina, 1758.

R. neo-mexicana.—A small tree with beautiful rosy-pink flowers. The seed-pods are covered with large viscid bristles. New Mexico, 1882.

R. Pseudacacia, False Acacia.—A variable tree both in habit and foliage. Its branches are very brittle. Among the best varieties are—*inermis*, thornless, dwarfish, and round-headed; *Bessoniana*, of free bold habit, with thornless branches; *Decaisneana*, with bright rosy-pink flowers; *monophylla*, leaves reduced to a single leaflet; and *pyramidalis*, of close, erect, columnar habit. North America, 1646.

R. viscosa.—A smaller tree, with clammy shoots and rose-pink flowers. North America, 1797.

ROSA.—The garden varieties of the Rose are dealt with elsewhere. The following are the wild types, many of which, although they do not last in flower so long as the "Teas" and "Hybrid Perpetuals", possess great beauty and elegance. The climbing species are valuable for covering walls, unsightly buildings, arbours, &c., whilst the sturdier, more erect kinds may be used effectively in shrubberies, the wild garden, &c.

R. alpina.—The type of the Bourasult Rose. *Amadis* is one of the best varieties, being very hardy, a profuse bloomer, and almost destitute of thorns. The flowers are large, semi-double, and of a deep-purple colour. Europe, 1603.

R. arvensis (*R. repens*).—The Ayrshire Roses belong to this native species, and from their hardiness and rapid growth are valuable for covering trunks of trees, buildings, &c. We have seen living trees of the Spruce Fir, 40 feet high, festooned to the top with that excellent variety *Bennett's Seedling* or *Thoresbyana*, a very profuse-flowering double white variety, with blossoms of medium size.

R. Banksia.—The Banksian Rose, which needs shelter and a warm aspect. The glossy foliage, and large clusters of small white or yellow flowers, render it exceedingly ornamental; and, moreover, it is almost thornless. China, 1807.

R. canina, Dog Rose.—There are innumerable forms of this native Rose, some very handsome when in fruit.

R. centifolia.—A low bushy shrub, with large, drooping, exquisitely-scented, white or red, single or double flowers. Caucasus, 1596. This includes the well-known Provence or Cabbage Rose and the Moss Rose, which are old favourites in gardens.

R. indica, China Rose.—Numerous hybrids and varieties of this have been raised, one of the best of which is *sanguinea*, with deep-crimson flowers produced continuously from the middle of summer until autumn. China, 1789.

R. lutea, Austrian Brier.—A dwarf species with erect prickly stems, and yellow flowers produced in June. The double variety and var. *Harrisoni* are very beautiful. Orient, 1596.

R. macrophylla.—A strong grower 8 feet high, with

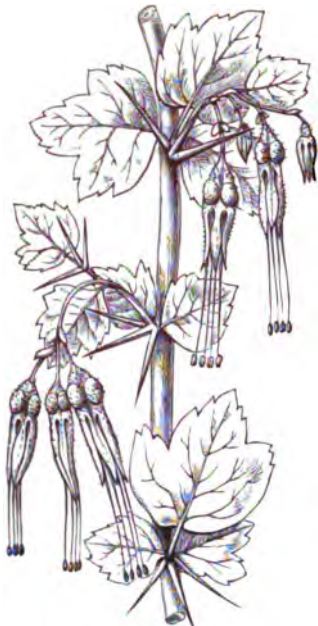


Fig. 390.—*Ribes speciosum*.

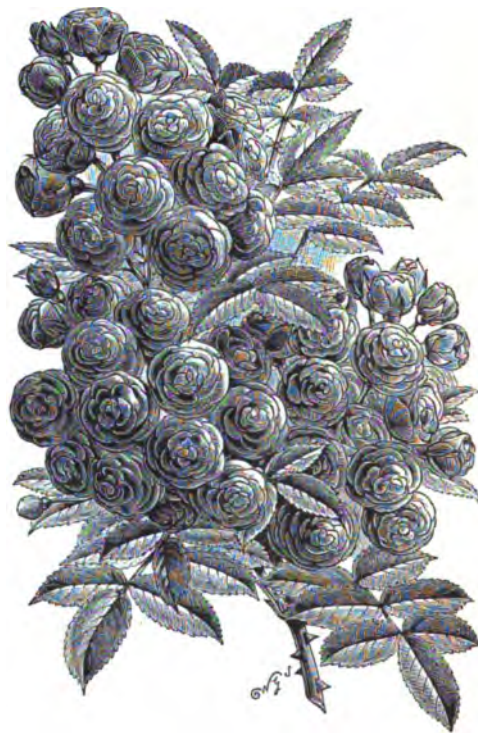


Fig. 391.—Rose (Crimson Rambler).

much-divided leaves. Flowers bright rosy-red. India, China.

R. microphylla.—A very distinct and beautiful species of sturdy habit, the fruits armed with spines. Flowers of a delicate blush colour. China, 1828.

R. moschata (*R. Brunoni*).—A useful, vigorous climber; flowers yellowish-white. Asia Minor, &c., 1596.

R. multiflora (*R. polyantha*).—A very distinct Rose, remarkable for the small size of its white or pink flowers, which scarcely exceeds that of the double-flowered Bramble. *Crimson Rambler* (fig. 391), a recent introduction from Japan, is a form of this, but is a stronger grower; the flowers are larger, double, and of a rich bright-crimson. China and Japan, 1822.

R. pomifera.—A sturdy shrub worth growing for the beauty of its large, bristly, deep-red fruits. Europe.

R. rubiginosa, Sweet-Brier.—This native Rose should find a place in every garden, on account of the refreshing fragrance exhaled from the glands of its leaves. The flowers are pink. A series of beautiful hybrids between this and several garden Roses have been raised by the late Lord Penzance, and are known as Penzance Briers.

R. rugosa (*R. ferox*).—A very robust shrub, reaching a height of 4 to 6 feet, noteworthy for its handsome foliage. The flowers are rosy-red, followed by bright orange or red fruits. The plant is remarkable for its numerous prickles. There is a white-flowered variety, also one with double flowers. Japan, 1845. Numerous hybrids have lately been raised between this and other Roses.

R. sempervirens, Evergreen Rose.—This has long hooked prickles, shining glabrous leaves, and clustered fragrant flowers of medium size. Not so hardy as many of those mentioned. Southern Europe, 1629.

R. setigera, Prairie Rose.—A climbing species with large, deep-rose-coloured flowers. Useful in flowering late—from July onwards. North America.

R. spinosissima (*R. pimpinellifolia*), Scotch Rose.—This is a small-leaved, very prickly little bush-Rose, which grows wild in open places, especially sandy sea-shores, in



Fig. 392.—*Rosa Wichuriana*. (†.)

the British Islands. It bears a profusion of white or blush flowers for a long season. There are many varieties, of which *altaica* (*R. grandiflora*), 6 feet high, with creamy-white flowers, and *hispidula* (*R. lutescens*), about the same height and with pale-yellow flowers, deserve special mention.

R. Wichuriana, Monument Rose (fig. 392).—A vigorous trailer suitable for covering banks; the leaves are of a

glossy dark-green, the flowers white and produced in July and August. Japan, 1892.

ROSMARINUS officinalis.—The Rosemary in deep free soils attains a height of 6 to 8 feet, and should find a place in every shrubbery or mixed flower-garden. It flowers in winter or early spring, and flourishes on the coast. Southern Europe, 1548.

RUBUS, Bramble.—Nearly all the Brambles are of rambling growth and require some support. There are,



Fig. 393.—*Rubus deliciosus*. (†.)

however, several of sturdy, erect growth, such as *R. deliciosus* and *odoratus*.

R. biflorus.—Commonly cultivated under the erroneous name of *R. leucodermis*. It is remarkable for its white stems, which present the appearance of having been white-washed; flowers white, fruit orange-red. It will rapidly cover a large space, and is perfectly hardy. Mountains of Northern India, 1818.

R. deliciosus (fig. 393).—One of the most beautiful. Its leaves are like those of the Currant, and the stems, which are devoid of prickles, are erect and self-supporting. Its shoots are a yard long, and in May are crowded with pure-white flowers 2 inches across. It is a rather difficult plant to propagate, layering being the most successful method. Rocky Mountains, 1870.

R. fruticosus.—This is the old name applied collectively to the common Brambles; they are now divided into numerous species, and some of them are well worth cultivating. The cut-leaved *laciniatus* and the double-white and double-pink forms of *thyrsoides* and *ulmifolius* are among the best. There is also a variegated variety.

R. nutkanus.—This and the next have lobed, not digitate leaves. Flowers white, produced from May to October, succeeded by large red fruits. North America, 1826.

R. odoratus.—Similar to the last, but having purplish-red flowers. North America, 1739.

R. phenicolasius, Japanese Wineberry.—Although this was introduced from Japan in 1877, it was for some years grown only as a greenhouse plant. It has, however, proved hardy in many districts. Its flowers are pink, and are followed by scarlet edible fruits, like Raspberries, which constitute the chief claim of the plant to recognition. The leaves and stems are covered with reddish hairs.

R. spectabilis.—A desirable North American species introduced in 1827, having trifoliate leaves, large purplish, fragrant flowers and yellow fruit.

R. villosus.—Several varieties of this are cultivated for their fruits in North America, but in this country they have not proved a success except when grown for their flowers. These are large, pure-white, and very abundant. The habit is erect. North America, 1777.

Ruscus.—A peculiar genus of shrubs with leaf-like branches, white or greenish flowers, and red berries.

R. aculeatus, Butcher's Broom.—Grows well under trees and in town gardens, as the stems are renewed every second year. Flowers solitary on the upper surface of the dilated branches. The two sexes are borne on

separate plants, hence the rarity of the berries in some plantations. British.

R. hypoglossum.—A dwarf plant 12 to 18 inches high; the leaf-like branches are oblong, 3 to 5 inches long, and pointed. Mediterranean region, 1640.

R. racemosus, Alexandrian Laurel. This is a handsome shrub 3 or 4 feet high, with glossy dark-green leaves (branches), and terminal racemes of small flowers. Portugal, 1739.

SALIX.—The Willows are valuable for planting in wet places, are very tenacious of life, and will grow in soil of



Fig 204.—*Skimmia japonica*.

almost any description, and under conditions that few other trees would endure. They include some of the most graceful of weeping trees. Where not stated otherwise, they are indigenous.

S. alba.—A large tree 60 to 80 feet high. Cricket-bats are made from the wood.

S. babylonica.—This is the old Weeping Willow, believed to have come originally from China.

S. Caprea, Goat or Sallow Willow.—A small tree with broad, rough foliage. It grows in a saline atmosphere better than most other plants. The variety *pendula* is the Kilmarnock Weeping Willow.

S. fragilis, Crack Willow.—A tall tree 60 to 90 feet high, with narrow, glossy leaves.

S. incana (*S. rosmarinifolia*).—A very handsome small tree, with long, narrow leaves.

S. pentandra, Bay Willow.—About 20 feet high, with broad, smooth, shining leaves. Flowers later than any other British species.

S. purpurea, Purple Osier.—A small tree or shrub, with reddish or purple bark. The "American" Weeping Willow of nurseries is a form of this.

S. vitellina, Golden Osier.—A yellow-barked variety of *S. alba*. Valuable for producing colour effects in winter. It should be pruned back hard every spring so as to induce a free growth of long shoots. There is also a red-barked variety.

SAMBUCCUS nigra, Elder.—This succeeds well on a chalky soil, and withstands the smoky atmosphere of

towns. The variety *laciniata* has deeply-cut leaves, and *aurea* is a fine golden-leaved variety.

S. racemosa.—This is most deserving of a place in a shrubbery, its foliage being much less coarse than the common variety and its fruits of a bright-scarlet. Southern Europe, 1596.

SANTOLINA Chamæcyparissus, Cotton Lavender.—A dwarf compact shrub 2 to 3 feet high, with small dense linear leaves clothed with a close hoary pubescence, and furnished with four to six rows of short teeth projecting in all directions. The yellow flower-heads are borne on stalks from 6 to 12 inches long in June or July. Succeeds in a poor dry soil. *S. squarrosa*, *incana*, &c., are varieties. Southern Europe, 1573.

SCHIZANDRA chinensis (*Maximowiczia chinensis*).—A handsome climbing shrub attaining a height of 20 feet. Leaves simple, furnished with pellucid dots; flowers bright rosy-carmine succeeded by scarlet berries which are persistent during a greater part of the winter. Northern China, 1860.

SHEPHERDIA argentea, Buffalo-Berry.—A shrub or small tree, with narrow silvery leaves, yellowish-white flowers, and scarlet fruits. Allied to *Elaeagnus*. North America, 1818.

SKIMMIA.—Dwarf shrubs with alternate glabrous leaves, having numerous transparent dots and terminal panicles of fragrant white flowers succeeded by red berries. There are three species in cultivation, and numerous seedling forms and hybrids have been raised.

S. Fortunei (*S. japonica* of gardens).—This is a dwarfier plant than the others, with lanceolate, dark-green leaves, hermaphrodite flowers, and dark-red obovate fruits. China, 1849.

S. japonica (*S. oblata*) (fig. 394).—Usually dioecious, the male plant being often known as *S. fragrans*, the female as *S. oblata*. The leaves are elliptical-obovate, larger than those of *S. Fortunei*, the oblate berries being bright-scarlet. Japan, 1864.

S. Laureola is a tender species of little value. It can always be recognized by the disagreeable odour of its leaves. Nepal.

SMILAX aspera.—An elegant climbing shrub, furnished with crooked spines and tendrils. Leaves heart-shaped, with five longitudinal ribs. Flowers small, whitish or red, male and female on separate plants, the latter, when fertilized, succeeded by clustered scarlet or black berries. Suitable for covering a small extent of wall. Southern Europe, 1856.

S. rotundifolia.—One of the hardiest and most vigorous of climbers. The leaves are of a dark, very glossy green. Useful for covering rooteries, &c. North America.

SOLANUM crispum.—A showy woody plant, with long branches, growing 12 to 14 feet high against a wall; the leaves are ovate and somewhat wavy, and the bluish-purple fragrant flowers are very abundantly produced in large corymbs. It has survived some of our severest winters in Scotland. Chili, 1824.

SOPHORA japonica.—A fine spreading tree growing from 40 to 50 feet high. Leaves dark-green, pinnate; flowers dull-white. Japan, 1763. The variety *pendula* is an exceedingly beautiful example of the weeping tree. Flowers in September.

SPARTIUM junceum, Spanish Broom.—A loose-growing shrub 6 feet high, with slender branches, and large yellow flowers in terminal racemes, appearing late in summer. There is a variety with double flowers. It succeeds well near the sea, and in poor, gravelly soil. Mediterranean region, 1548.

SPIRÆA.—The shrubby species are among the most ornamental of hardy flowering shrubs, and of the forty or so now in cultivation, at least half are worthy of a place in the garden. They require no special treatment, and a moist fairly-rich soil suits them. (See also *NEILLIA* and *EXOCHORDA*.)

S. arguta.—A small shrub of hybrid origin. It has small leaves and thin arching branches, which in spring are laden with numerous small white flowers. By many it is considered the most beautiful of the Spiræas.

S. bella.—From 3 to 4 feet high, with small ovate leaves, and terminal corymbs of rosy-red flowers. Northern India, 1820.

S. bracteata (*S. media* var. *rotundifolia*).—Dwarf and compact, with elliptical leaves toothed near the apex. Flowers pure-white, fragrant, and produced in compact, rounded corymbs. Japan.

S. bullata (*S. crispifolia*).—A compact little shrub a foot high, with deep-green convex leaves and dark-pink flowers. Japan.

S. discolor (*S. ariaefolia*).—A much-branched, bushy shrub 6 to 10 feet high, with leaves resembling those of the White-Beam tree, and a profusion of small whitish flowers in large terminal panicles late in summer. North-West America, 1827.

S. Douglasii.—A compact shrub, with ovate leaves, and rose-coloured flowers in dense terminal panicles. North-West America, 1840.

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S. hypericifolia.—An exceedingly variable hardy shrub, with small simple leaves and white flowers. Northern Asia, 1840.

S. japonica (*S. callosa*, *S. Fortunei*).—A handsome species of erect growth with lanceolate serrated leaves and flat corymbs of rosy flowers. China and Japan, 1859. Vars. *alba* and *rubra* have white and deep-red flowers respectively. One of the most charming varieties is *Bumalda*, a dwarfier and more compact grower, with carmine flowers. A variety called "Anthony Waterer" (fig. 395) has brighter-coloured flowers, and is a most



Fig. 395.—*Spiraea japonica* A. Waterer.

useful summer- and autumn-flowering shrub. There are numerous hybrids or varieties of this species, which are all characterized by the large flat corymbs of flowers. Their flowering season is lengthened by removing the flowers as they fade, so as to prevent seeding.

S. Lindleyana.—A branching shrub 8 feet high, with large pinnate leaves, and large terminal panicles of white flowers produced in autumn. Northern India, 1840. *S. sorbifolia* is closely allied to it but dwarfier.

S. media (*S. confusa*).—A pretty species, with corymbs of white flowers, very useful for forcing. Europe, &c.

S. Millefolium (fig. 396).—A remarkable shrub 4 to 6 feet high, with leaves minutely cut and divided so as to resemble the Milfoil of our waysides. Flowers white, in terminal pyramidal racemes. California.

S. Nobleana, *S. tomentosa*, and *S. salicifolia* are all showy species near *S. Douglasii*.

S. prunifolia.—The double-flowered variety of this is common in gardens; it has slender branches, small leaves, and an abundance of small pure-white rosette-like flowers. Japan, 1845.

S. Thunbergii.—A graceful shrub, the earliest to flower of all the Spiræas. It has thin wiry branches; the leaves are small, linear, and the flowers white. Japan.

S. trilobata.—A handsome and useful shrub, with smooth, rounded, crenate leaves and numerous compact corymbs of white flowers produced in May. North Asia, 1801. *S. Van Houttei* is a hybrid of similar character raised from this species and *S. media*.

STACHYRUS praeox.—A shrub or small tree, with red

bark, ovate leaves, and beautiful spikes of yellowish-white flowers produced in great profusion before the



Fig. 396.—*Spiraea Millefolium*. (S.)

leaves are unfolded, in February or March. Except in the south-west it requires the shelter of a wall. Japan, 1864.

STAPHYLEA colchica.—A shrub 4 or 5 feet high, the



Fig. 397.—*Staurtia pentagyna*. (S.)

leaves consisting of three, or sometimes five, serrated leaflets. The flowers are produced in large erect branching racemes. Caucasus, 1870. *S. Coulombieri* is a fine hybrid between this and *S. pinnata*.

S. pinnata, Bladder-nut.—A shrub from 6 to 8 feet high, with unequally pinnate leaves, and whitish flowers in May or June, succeeded by a bladder-like capsular fruit. Southern Europe, and naturalized in some parts of Britain.

S. trifolia is a North American species with trifoliate leaves. 1640.

STAUNTONIA hexaphylla (*Holboëllia latifolia*).—An ornamental climber, suitable only for the milder parts of the kingdom. It has ample palmately-divided leaves, and curious purplish flowers. Northern India, 1845.

STEPHANANDRA flexuosa.—A very elegant shrub about 4 feet high, the leaves of which are deeply lobed and toothed. The flowers occur in flat racemes and are dull-white. It is a near ally of the *Spiræas*. Japan, 1870.

STUARTIA.—A genus consisting of five shrubs, natives of North America and Japan. They are extremely beautiful plants, closely allied to the *Camellias* and with similar flowers, but they are deciduous. They are slow-growing when young and are impatient of disturbance at the root. They require a sheltered position.

S. pentagyna (fig. 397).—A stout shrub 10 to 15 feet high, with creamy white flowers 3 to 4 inches in diameter, the numerous stamens being reddish-purple. North America, 1785.

S. pseudo-Camellia.—Leaves somewhat like those of a *Camellia*, occasionally turning to crimson and gold in autumn. Flowers rose-tinted white, 2½ inches across. Japan.

S. virginica.—Leaves ovate, slightly serrated. Flowers white, 2 inches in diameter. North America, 1743.



Fig. 398.—*Styrax japonica*. (A.)

STYRAX japonica (fig. 398) is a small tree with white flowers produced in spring in pendulous racemes. Japan, 1868.

S. Obassia.—A beautiful shrub recently introduced from Japan. Leaves oblate, varying from 3 to 8 inches in width, the margins irregularly toothed. Flowers white and fragrant, 1½ inch in diameter, in pendulous racemes 9 inches long.

S. officinale.—A small shrub, with simple leaves, and axillary racemes of white flowers, resembling those of the Orange, and appearing in June or July. Syria, &c., 1597.

SYMPHORICARPUS racemosus, Snowberry.—A much-branched shrub 4 to 7 feet, with slender branchlets, small simple leaves, and small funnel-shaped pink flowers, succeeded by large white berries. It will grow under trees, and is useful for filling shady spots. North America,

1817. There are several other species from the same country, but they are rarely seen in gardens. *S. orbiculatus* (*vulgaris*) has red and yellow flowers and purple berries.

SYRINGA.—The Lilacs are among the most universally admired of spring-flowering shrubs. In addition to the following species and varieties, there are many hybrids



Fig. 399.—*Syringa japonica*.

cultivated by nurserymen, and described in their catalogues.

S. chinensis (*S. dubia*, *S. rothomagensis*).—Probably a hybrid between *S. persica* and *S. vulgaris*. The flowers appear in May and June, and are deep violet.

S. Emodi.—Stems covered with warty excrescences; leaves large, prominently reticulated. Flowers purple-lilac or white. Mountains of Northern India, 1840.

S. japonica (fig. 399).—A small tree 15 to 25 feet high, with light-reddish bark. The leaves are about 5 inches long, ovate and pointed, the small white flowers being produced in immense branching panicles. It is perfectly hardy, but requires a sunny position. Japan, 1885.

S. Josikaea.—This grows from 5 to 10 feet high, and has dark-green wrinkled leaves, and scentless, smallish, bluish-purple flowers. It is useful in flowering after the other Lilacs are past. Transylvania, 1835.

S. persica, Persian Lilac.—Of small stature, rarely exceeding 4 or 5 feet in height, with slender straight branches. The flowers vary from rosy-carmine to white. Persia, 1640. The original form is now rarely met with, being supplanted by a larger-flowered variety.

S. vulgaris, Common Lilac.—Among the numerous varieties or hybrids of this we may note *alba* with white, *rubra* with red, and *violacea* with violet flowers. Of those of more recent origin, *Dr. Lindley* has extremely large clusters of reddish-lilac flowers; *rubra insignis* and *grandiflora* have larger red flowers; and *Charles X.* is remarkable for the immense size of its panicles and the beautiful tint of its reddish-lilac flowers. *Souvenir de Louis Spath* is the darkest-coloured of all the varieties. *Marie Lagraye* is one of the best whites, and *Madame Lemoine* is unequalled among the double-flowered sorts. South-eastern Europe, &c., 1597.

TAMARIX.—Half-evergreen, Cypress-like shrubs, with straight, whip-like branches, and small scale-like imbricated leaves. Flowers small, in spicate panicles, rose,

pink, or white. These shrubs are valuable for the sea-side, as they flourish in sandy soil where scarcely anything else will live. As they are impatient of transplanting, they should be permanently placed when young.

T. chinensis (*T. japonica plumosa*).—A very graceful species with luxuriant plume-like branches, but not so hardy as the following. China.

T. gallica, Tamarisk.—This has lateral spikes of pink or white flowers produced from May to October. Mediterranean, now naturalized in some parts of Britain.

TECOMA *radicans* (*Bignonia radicans*), Trumpet Flower.—A tall climber with opposite pinnate leaves, and very showy orange and scarlet flowers produced in autumn. It supports itself by means of rootlets from the joints of the stem, and succeeds best against a warm wall or bank. North America, 1640.

TILIA.—Limes are usually tall trees of close habit, leaves cordate, flowers fragrant, in small cymes attached to a leafy bract. The varieties in cultivation are very numerous.

T. americana.—This includes *canadensis*, *nigra*, *glabra*, &c. There is a fine variety, *mississippiensis*, with leaves nearly a foot in length. It grows from 60 to 70 feet high. North America, 1752.

T. argentea (*T. alba*).—This forms a handsome tree 60 feet or more high, with a grayish-white bark, and leaves silvery beneath. South-eastern Europe, 1767.

T. cordata (*T. microphylla*).—A small tree found wild in a few places in Britain, flowers later than either *T. platyphyllos* or *T. vulgaris*. The leaves are smaller and the tree more bushy and compact than either.

T. dasystyla (*T. euchlora*).—A fine species introduced from the Caucasus in 1884. The leaves are the largest of any Old World Lime.

T. petiolaris (*T. americana pendula*).—This is a fine tree of pendulous growth. The leaves are silvery beneath,

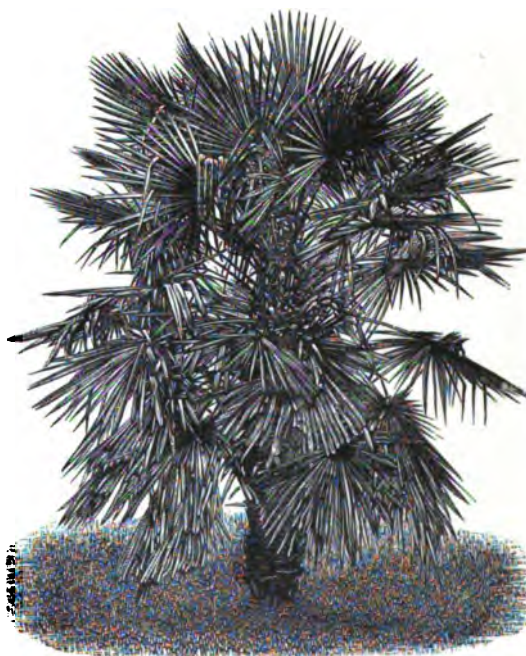


Fig. 400.—*Trachycarpus excelsus*.

as in *T. argentea*, but the petioles are much longer. Eastern Europe.

T. platyphyllos and *T. vulgaris* are two species formerly united under the name of *T. europæa*. The former flowers before *T. vulgaris*, and is further distinguished by the under-surface of the leaves (and sometimes the upper) being downy.

T. vulgaris, the Lime, has leaves quite smooth above, and downy only underneath in the axils of the veins. Both it and the last named are wild in Britain, although probably not true natives.

TRACHYCARPUS excelsus (*Chamærops Fortunei*) (fig. 400).—This Palm is quite hardy in the southern half of England, but should, if possible, be planted where protection from winds (especially north and east) is afforded. Being very slow growing it is usual to plant out old specimens that have been grown indoors. Leaves palmate. China and Japan, 1844.

ULEX europæus, Furze, Gorse, or Whin.—The double-flowered variety as well as the single are both valuable for shelter, and for planting close to the sea. They transplant badly, unless prepared or grown in pots; but the type can be readily established by sowing the seeds where plants are desired.

U. nanus, Cat Whin, and *U. Gallii* are useful in being dwarfer than the common Furze. They flower in autumn. Britain.

ULMUS.—In addition to the numerous species of Elm in cultivation, there are also many varieties, diverse in size, habit, and foliage, and some have corky-barked branches.

U. alata, Winged Elm.—A smaller tree than either of the following, and remarkable for its corky-winged branches. North America, 1820.

U. campestris, Elm.—The common typical form has small leaves, does not form a spreading head, and very rarely ripens seed. Desirable varieties are *Berardi*, slender habit and very small foliage; *viminialis*, still more slender; *fastigiata*, of upright growth; and *virens*, a sub-evergreen. There are also variegated varieties both of the small and large leaved forms, and a golden-leaved one called Louis van Houtte. The Cornish Elm is another form of it. Though common in Britain, the Elm is supposed to have been introduced from the Continent of Europe.

U. montana, Wych Elm.—Perhaps the tallest of native trees. It has large, spreading branches, and is prolific in varieties. *Plumosa* is very vigorous, with large distichous leaves; *filicifolia* has dissected foliage; *pendula* is a weeping form.

UMBELLULARIA (*Oreodaphne*) *californica*.—An evergreen tree from North-Western America, introduced by Douglas. It has the aspect of a Sweet Bay, and attains a height of 30 to 100 feet in its native country. Except in the south-west it requires a wall.

VACCINIUM.—Erect or prostrate, evergreen or deciduous shrubs, with small and rather inconspicuous flowers, succeeded by more showy black, red, or purple berries, usually covered with a glaucous powder or bloom. The species are numerous, but none of them are commonly cultivated. *V. Myrtillus*, the Whortleberry or Bilberry, is a dwarf spreading bush with angular stems, ovate deciduous leaves, small pink-white axillary flowers, and bluish-black berries. *V. Vitis-idea*, Cowberry, is an evergreen native species, with racemose flowers and red berries. *V. corymbosum*, *V. pennsylvanicum*, and *V. stamineum* are amongst the most useful in the genus, their leaves assuming in autumn a bright-red colour. They are all North American.

V. ovatum (fig. 401).—An erect, dense-growing shrub,

with closely-set, ovate, dark evergreen leaves. The flowers are rosy-white and produced in short axillary clusters. Fruit at first red, then black. It grows 3 feet to 5 feet

high, but is only hardy in the south. Western North America, 1826.

VERONICA.

Some of the New Zealand shrubby species are sufficiently hardy for the south and west coasts, and even in Scotland near the

sea, and are exceedingly ornamental in winter and early spring. *V. speciosa*, with glossy oblong coriaceous leaves, and *V. salicifolia* and *V. macrocarpa*, with linear-lanceolate leaves, are the parents of the beautiful hybrids with white, blue, purple, red, or crimson flowers, such as *Andersoni*, *versicolor*, *Lindleyana*, *kermesina*, &c.

V. pinguifolia (fig. 402).—A dwarf compact sub-erect shrub, with short gray-green foliage and crowded axillary spikes of white flowers. New Zealand. *V. Traversii* (*V. decussata*).—A shrub 3 to 4 feet high;

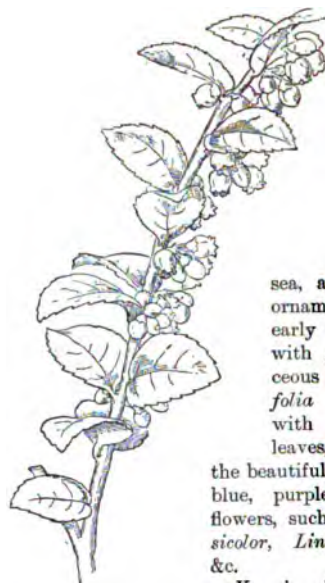


Fig. 401.—*Vaccinium ovatum*. (t.)



Fig. 402.—*Veronica pinguifolia*.

one of the hardiest and most useful for growing outside, and is a charming evergreen, although killed in very hard winters. Leaves short, sessile, narrowly oblong, deep-

green. Flowers bluish-white, in short racemes. New Zealand, 1873.

VIBURNUM.—A genus consisting of both deciduous and evergreen shrubs, and comprising some very ornamental species.

V. Lantana, Wayfaring-tree.—An indigenous shrub from 19 to 20 feet high, with rugose, oblong-cordate

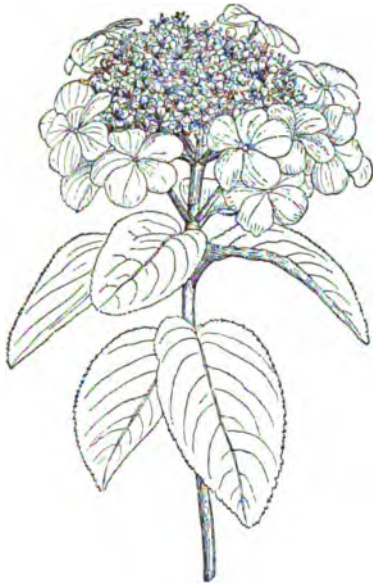


Fig. 403.—*Viburnum Keteleerii*. (4.)

leaves, and terminal flat cymes of white flowers in May or June, and red, eventually black flattened fruits. *V. cotinifolium*, a Himalayan species introduced in 1830, is probably a form of this, differing in having a more rounded leaf.

V. macrocephalum.—This has enormous clusters of barren flowers like the Guelder Rose, but is not so hardy. China, 1844. *V. Keteleerii* (fig. 403) is the wild type of this, its flowers, with the exception of those at the outside of the cluster, being fertile. 1863.

V. Opulus, Guelder Rose, Snowball-tree.—The ordinary wild form has only the outer flowers sterile and enlarged, but in the more familiar cultivated one known as var. *sterile* they are all transformed, so that the flower-heads form white balls. They, however, lack the charm of the bright-red fruits in autumn which make the wild type so attractive. There is a dwarf variety called *nanum*, which never flowers, and the variety *variegatum* has the foliage variegated with white and yellow.

V. plicatum (fig. 404).—A handsome species with flower-heads similar to those of the cultivated variety of *V. Opulus*, but the oblong-orbicular serrate leaves are distinctly plaited. Northern China, 1844. *V. tomentosum* is the wild type of this. A large proportion of its flowers are small and fertile.

V. Tinus, the Laurustinus.—The only evergreen species of this genus in general cultivation, and one of the most valuable of winter-flowering shrubs. It flourishes either on sand-rock, chalk, or limestone, or near the sea. There are several varieties: *hirta* is remarkable for the hairiness of its branches and leaves; *lucida* has larger and less abundant flowers than the common variety; and *striata* is of more erect habit. South Europe, 1569.

VINCA.—The Periwinkles are low trailing shrubs, with

glossy simple leaves and solitary axillary flowers, produced from March to May. Both are indigenous or naturalized in Britain, and thrive well in shady places.

V. major.—This grows a foot or more in height, with oval heart-shaped leaves and large bright-blue flowers. There are several varieties, including variegated ones. Those named *elegantissima* and *aureo-reticulata* are the best.

V. minor.—Smaller in all its parts and more carpet-like in habit than the preceding. There are blue, reddish-purple, and white single and double flowered varieties, and others in which the foliage is variegated with white or yellow.

VISCUM album, Mistletoe.—This native parasite may be introduced sparingly in those parts of the country where it is rare. It will grow on the Lime, Poplar, Thorn, Apple, and other trees. Ripe berries should be inserted in the forks of the branches and protected from birds till they have germinated.

VITEX *Agnus-castus*, Chaste-tree.—An aromatic shrub 6 to 10 feet, with digitate leaves consisting of five to seven leaflets, and small violet flowers in terminal panicles, produced late in autumn. It requires protection in most parts of Britain. South Europe, 1570.

VITIS.—Some of the hardy woody species of this very extensive and polymorphic genus are valuable as climbing plants for covering wall surfaces; others, especially those with foliage which becomes richly coloured in autumn, are used with fine effect for climbing over decaying trees, semi-wild pieces of shrubbery, pergolas, &c. Used in this manner they should be planted some distance away



Fig. 404.—*Viburnum plicatum*.

from the stems of other trees and given a pocket of rich soil in order to start them into vigorous growth. See also **AMPELOPSIS**.

V. Coignetia (*V. congesta*) (fig. 405).—A recent introduction from Japan. It is not unlike *V. vinifera* in habit, but the leaves are larger, rounded, but little lobed, and covered beneath with a brownish felt. In autumn they change from dark-green to a rich crimson. A finer garden plant than any of the North American Vines. 1893.

V. heterophylla.—The hop-leaved variety—*humulifolia*—is a slender-growing kind with small lobed leaves; its small spherical fruits are of a pale turquoise-blue colour, and are frequently borne in profusion. It requires a rather warm, dry position, preferably a south wall. Japan, 1868.

V. Labrusca.—A strong-growing species from North America; its large coarse leaves being covered on the lower surface with a thick reddish felt. 1656.

V. riparia (*V. odoratissima*).—A woody climber with the same habit as the common Grape Vine, growing 20 to 30 feet high, and furnished with tendrils. The leaves are heart-shaped, 4 to 6 inches across, shallowly three-cleft and toothed at the edge, and the small greenish-yellow flowers are remarkably sweet-scented with the odour

of Mignonette. The fruit is of no value. North America, 1806.

V. vinifera, Grape Vine.—A well-known tendril-bearing woody climber, useful for covering walls or pillars. It will grow from 20 to 50 feet, and may be trained within any desired limit. The leaves are lobed and toothed, and the ripe fruit edible. The Parsley-leaved and the Miller's Grape have remarkable foliage, the former cut into narrow segments, and the latter white with hoary down. In the Teinturier Grape the leaves die off a beautiful claret-red. Almost all the varieties may be cultivated for their foliage in the open air, and some of the hardier sorts, as Royal Muscadine and the Miller's Grape, occasionally ripen good serviceable fruit.

WISTARIA.—A genus of beautiful deciduous climbers, natives of Japan, China, and the United States. The flowers are papilionaceous and are produced in pendent racemes. Leaves pinnate. Although the species flower most profusely, they only ripen seeds in this country after exceptionally warm summers; they can, however, be readily propagated by layering.

W. chinensis.—A valuable climber often used on the walls of dwelling-houses, &c., and sometimes for climbing over large trees. The bluish-lilac flowers are borne in

May and June. There are white, double, and variegated varieties in cultivation. China, 1816.

W. multijuga.—Remarkable for the length of its racemes, which are from 1½ to 2½ feet long. The flowers are lilac-coloured, smaller than those of *W. chinensis*, and not so densely packed on the raceme. Japan, 1874. *W. frutescens*, a North American species, and its var. *magnifica*, both with lilac-purple, fragrant flowers; and *W. japonica* with white flowers, are also desirable plants.

XANTHOCERAS sorbifolia.—A handsome small tree allied to the Horse-Chestnut, but resembling the Mountain Ash. The flowers are white with a purple eye, borne in terminal racemes. Northern China, 1874.

YUCCA.—The hardy species form a distinct feature in the garden. They are tufted, or form stems from 6 to 10 feet high; leaves sword-shaped, often sharp-pointed; flowers large, bell-shaped, white, in large much-branched panicles. The hardy species are natives of the southern states of North America, and they succeed best in a well-drained warm soil, on mounds, and in the vicinity of the sea.

Y. gloriosa is the hardiest and the most free-flowering; it forms a branched stem, 6 feet or more in height in favourable situations. *Y. recurvifolia* (fig. 406) is a similar plant, but it has recurved, not sharp-pointed leaves. *Y.*



Fig. 405.—*Vitis Coignetia*.



Fig. 406.—*Yucca recurvifolia*.

angustifolia has narrow leaves 2 feet in length, furnished with numerous filaments on the margins, and is very handsome when in flower. *Y. filamentosa* is almost stemless, and is remarkable for the loose threads on the margin of the leaves. There are several other handsome species and varieties that would succeed in the south-west.

ZELKOWA crenata (*Planera Richardi*).—An ornamental tree 50 to 60 feet high, resembling an Elm in foliage, but with a smooth bark, and a much-branched crown like an erect-growing Beech. Western Asia, 1760.

ZENOBIA speciosa (*Andromeda speciosa*).—A charming ericaceous plant 3 to 4 feet high, with oval leaves. The flowers are white and drooping, produced in summer. The variety *pulverulenta* is a superior form with white glaucous leaves. North America, 1800.

II. HARDY CONIFERS.

The Conifers (or cone-bearers) form a large and important family of trees and shrubs which are found most abundantly in the temperate regions of the globe, although in Great Britain there are only three species truly indigenous—the Yew, the Scotch Pine, and the Juniper. The chief botanical characters that distinguish the Conifers from the trees and shrubs dealt with in the preceding pages are the naked ovules and seeds; i.e. the ovule is not produced in an ovary, nor does the seed ever become surrounded by any fruit-like covering. Whilst the Conifers include a few deciduous species, the prevailing type is evergreen, and the wood and leaves are more or less resinous. In contour and in foliage they are so distinct that they are as a rule readily recognized. The usual outline of the trees is conical, and the leaves of the species that are hardy in Britain are, with one or two exceptions, long in proportion to their width, becoming needle-like in many instances.

Although many of the European and some of the East-American Conifers had already been for many years in cultivation, the greatest impetus given to the formation of pineta in this country was directly the result of the travels of David Douglas in Western North America, on behalf of the Royal Horticultural Society, between 1823 and 1833. During that decade such Pines as *ponderosa*, *Coulteri*, *Lambertiana*, *insignis*; Silver Firs like *Abies nobilis* and *A. amabilis*; *Picea sitchensis*, the Douglas Fir, &c., were all added to British collections. The introductions by Douglas were followed by those of Hartweg, Jeffrey, and William Lobb from America, and later by those of Fortune, J. G. Veitch, and Maries from China and Japan.

A curious matter in connection with Conifers (more especially those of the Cypress tribe) is the propensity of some species to assume different guises both in foliage and in habit. Between the seedling and the adult states the leaves of most Conifers pass through transitory forms, but in the cases here alluded to, the same species may be represented by trees of large size, and yet of totally different aspect. This is due to the juvenile or other normally transitory forms of growth being retained. A marked example is furnished by *Cryptomeria*

elegans; this tree could scarcely be more distinct than it is from *C. japonica*, yet it is simply a form of that species “in which the shape of the primordial leaves is retained” (Masters). The Retinosporas again are all merely stages of growth of certain species of Thuja and Cupressus. “On the self-same bush have been found specimens of two and three different kinds of Retinospora, and we see others reverting to the adult form and bearing cones peculiar to it” (Masters).

The nomenclature of Conifers has for long been extremely involved and uncertain, and in consequence of this is heavily weighted with synonyms. The generic term *Abies* has by some authorities been made to apply only to the Spruce Firs, *Picea* referring to the Silver Firs; other authorities have simply reversed this arrangement; whilst others again have united the two, as well as *Tsuga* and *Pseudotsuga*, under *Abies*. In the following lists (with the exception of Retinospora—a name retained for purely garden convenience) the names, both generic and specific, are those adopted by Dr. Masters, whose contributions to the Conifer Conference of 1891 at Chiswick (see vol. xiv. of the *Journal of the Royal Horticultural Society*) form the latest authoritative arrangement of the order.

Conifers generally succeed best in a deep, rich, well-drained soil. Few attain to perfection on a hot, sandy ground, although the Pines will thrive well on gravelly soil. *Picea sitchensis*, *Cupressus thyoides*, *Abies balsamea*, *Taxodium distichum* are especially moisture-loving species. In stature, habit, colour of foliage, &c., Conifers display so much variety that they may be used for nearly all purposes, from the planting of parks and woodlands to the furnishing of the rockery. Amongst the numerous species adapted for large parks and pleasure-grounds, the following are of especial value: *Pseudotsuga Douglasi*, *Pinus Laricio*, and its varieties (including the Austrian Pine), *P. excelsa*, *P. Strobus*, *P. Cembra*, *P. ponderosa*, Scotch Pine, Cedar of Lebanon, *Cedrus atlantica*, *Thuja gigantea*, the common Larch, Spruce, and Silver Fir, *Picea orientalis*, *Abies concolor*, *A. grandis*, *A. Pinsapo*, *A. magnifica*, *A. nobilis*, *A. Nordmanniana*, *Cupressus Lawsoniana*, *C. nootkatensis*, *Tsuga Mertensiana*, *Libocedrus decurrens*, *Araucaria imbricata*, the common Yew. In sheltered localities, *Sequoia gigantea*, *S. sempervirens*, *Cupressus macrocarpa*, and *Cedrus Deodara* may be planted.

For smaller areas and lawns there is abundant choice; besides the smaller of those just men-

tioned there are the numerous varieties of the common Yew (golden, silver, pendulous, and erect), the *Retinosporas*, *Tsuga Pattoniana*, *T. Hookeriana*, *T. Sieboldi*, *Sciadopitys verticillata*, *Thuja dolabrata*, *T. occidentalis*, *T. orientalis*, *Cryptomeria elegans*, *Abies brachyphylla*, *Picea pungens* var. *glauca*, *P. polita*, *P. ajanensis*, *P. Morinda*, *Juniperus chinensis*, *J. virginiana*, *Pinus parviflora*, *P. Bungeana*, *P. monophylla*, and *Taxus adpressa*.

Of still smaller dimensions, and suited for small lawns, the rockery, &c., there may be mentioned: the dwarf forms of the common Spruce like *Gregoriana*, *pygmaea*, and *Clanbrassiliana*, *Picea nigra* var. *Doumetti*, *Pinus montana*, *Cryptomeria elegans* var. *nana*, *Taxus baccata* var. *ericoides*, *Prumnopitys elegans*, *Podocarpus alpinus*, the smaller *Retinosporas*, and the dwarf and prostrate Junipers.

For exposed positions on the coast the following have been found to succeed the best: the Austrian, Corsican, and Scotch Pines, *Pinus Pinaster*, *P. insignis*, *P. muricata*, the common Silver Fir, and *Cupressus macrocarpa*.

Conifers should never be allowed to become deformed or unshapely, and any tendency in that direction should be rectified as soon as noticed by pruning whilst the shoots are young. *Retinosporas* of the plumosa group are in some soils apt to become thin, but their appearance can be much improved by pinching off the stronger shoots twice or thrice during the summer. If it be necessary to remove large branches from Pines, *Abies*, &c., it should be done in September or October, and the wounds immediately tarred over. (See chapter on PRUNING.)

Various insects attack Conifers, and do so much injury that a sharp watch should be maintained in the garden to prevent their gaining a strong foothold. Several species of *Picea* are subject to the attacks of the "Spruce-gall aphid". The larvæ of this insect penetrate the bark, and cause a gall to form which varies from $\frac{1}{2}$ inch to 1 inch in length, and is shaped like the cone of a Pine. These galls should be removed by hand as early as possible in summer and burnt. The young shoots of several Pines, more especially *P. muricata* and *P. insignis*, are frequently destroyed by the larvæ of the "Pine beetle", these too should be removed and destroyed as soon as noticed. Various kinds of Aphides and scale infest the Larch (especially *Larix Griffithii*), Pines, &c.; these may as a rule be killed by syringing once or twice with a mixture of paraffin-oil, soft soap, and water.

ABIES.—This name is applied to the Silver Fir group, which may be distinguished from the Spruce Firs (*Picea*)

by their erect cones and by the leaves usually being two-ranked. They are grand evergreen trees of symmetrical growth, and include some of the handsomest of garden Conifers. For other species often given this generic name see *Picea*, *Pseudotsuga*, and *Tsuga*.

A. amabilis.—One of the finest, with beautiful dark glossy-green foliage, silvery beneath. It grows tall and straight, with a slender conical habit. North California, 1831.

A. balsamea, Balsam Fir.—This resembles the Silver Fir, but it attains only a height of 40 to 50 feet, and is liable to early decay. North America, 1696.

A. brachyphylla.—One of the hardiest of the Japanese species, and better adapted for growing near towns than many others. The leaves are bright-green above and have two silvery lines beneath, the apex being blunt or slightly notched. Cones purple, 3 to 4 inches long. Japan, 1870.

A. bracteata.—A tall slender tree, with leaves 2 to 3 inches long, and long slender bracts. As a young plant it starts into growth so early in spring that it is almost always injured by the late frosts. California, 1850.

A. cephalonica.—A tree 50 to 60 feet high, with the rigid sharp-pointed leaves regularly disposed, like a stiff bottle-brush, all around the branches. It commences its growth early, and is thus liable to be injured by frost. It should always be planted in elevated situations and on deep soils. Greece, 1824.

A. concolor.—A very handsome species, with leaves 2½ inches long, usually notched at the point, glaucous above, silvery beneath. It is erroneously known in gardens as *lasiocarpa*, *Parsonii*, and *Lowii*. The variety *violacea* is much more glaucous. California, &c., 1851.

A. firma (*A. bifida*).—The perfect hardiness of this, its quick growth when once established, and the deep glossy-green of its foliage make it a valuable species for ornamental planting. On young plants the leaves are deeply notched, but on cone-bearing branches they are almost or quite entire. Japan, 1861.

A. grandis.—A handsome hardy species 100 to 250 feet high. Leaves distichous, dark-green above, silvery beneath. North-West America, 1831.

A. magnifica.—Of somewhat stiff formal growth, the leaves being very glaucous when young and crowded on the branches. Similar to *A. nobilis*, but may be distinguished by the transverse section of the leaf being diamond-shaped. California, 1851.

A. Mariesii.—This is described as forming a tall, pyramidal tree in Japan. On young plants in this country the leaves are about an inch long, bilobed, and marked with two white lines beneath. Japan, 1879.

A. nobilis (fig. 407).—A tall handsome tree, bearing large erect cones while young. As seen in gardens it has crowded curved thick leaves of a glaucous, bluish-green tinge, afterwards assuming a darker hue. California, perfectly hardy in this country. 1831.

A. Nordmanniana.—Resembles the Silver Fir, but is both handsomer and hardier. Leaves dark-green and shining above, silvery beneath. Black Sea regions, 1845.

A. pectinata, Silver Fir.—This is quite hardy, save that when young it is often very much crippled by spring frosts. Central Europe, 1630.

A. Pinsapo.—Resembles *A. cephalonica*, but the light-green leaves are stouter and less sharply pointed, and not, like it, liable to be injured. A symmetrical densely branching tree 50 to 70 feet high, deservedly a great favourite, and one of the most beautiful ornaments of our lawns. Spain, 1839.

A. sachalinensis.—A handsome tree, with small narrow leaves. In Japan it forms a tall pyramidal tree. 1879.

A. Veitchii.—A slender tree, attaining a height of 100 feet in Japan. The leaves are densely arranged on



Fig. 407.—*Abies nobilis*.

the branches and are bright-green above, very glaucous beneath, varying from $\frac{1}{2}$ to 1 inch long. 1879.

ARAUCARIA imbricata, Chili Pine.—A remarkable tree, with rigid whorled branches clothed with thick hard spine-tipped imbricated leaves; it flourishes in sheltered positions where the soil is good and well drained. Chili, 1796.

BIOTA. See THUJA.

CEDRUS.—Noble trees, with horizontal branches (drooping when young in *C. Deodara*), and erect oblong or ovoid cones.

C. atlantica, Atlas Cedar.—A grand hardy tree, the foliage dark-green or silvery, and the branches less spreading than in the Cedar of Lebanon. Although always more or less silvery, the foliage varies considerably in different forms. Var. *glauca*, and still more *argentea*, are beautifully bright. Northern Africa, 1843.

C. Deodara, Deodar.—When young this has slender, flexible, drooping branches, a character it loses as it becomes older. Nurserymen distinguish several varieties, among which *crassifolia*, with short, thick, rigid foliage, *argentea*, with silvery foliage, and *robusta*, of stouter and more vigorous growth, are the most distinct. It grows in almost any tolerable soil, and in some parts of Britain promises to be a valuable timber-tree. As a rule, however, it does not thrive like the Atlas and Lebanon Cedars. Northern India, where it attains a height of 100 to 150 feet. 1822.

C. Libani, Cedar of Lebanon.—A majestic but slow-growing tree, with large spreading branches. Requires great care in transplanting. Syria, &c., introduced before 1683.

CEPHALOTAXUS.—Small trees with the foliage of Yews, and producing plum-like fruits.

C. drupacea.—This grows from 20 to 30 feet high, and has leaves 1 to $1\frac{1}{2}$ inch long. It succeeds best in moist shady situations. China and Japan, 1849.

C. Fortunei.—A very ornamental species from 40 to 50 feet high, with rigid two-ranked leaves nearly 3 inches long. Northern China, 1849.

C. pedunculata.—A shrub of dwarfer habit than either of the preceding; leaves dark-green above, marked underneath with two silvery lines. Var. *fastigiata* is an erect-growing form resembling the Irish Yew. Japan, 1837.

CRYPTOMERIA.—A small group from Japan and China, of ornamental aspect, only succeeding well in sheltered localities.

C. elegans.—Very distinct in character, and remarkable for its branchlets being decurved, and the spreading squarrose foliage changing to a brownish-green or bronzy tint in winter. Its general outline is broadly conical. In its native country it forms a tree 30 feet high, and is really a state of growth of the following species. Japan, 1863.

C. japonica, Japanese Cedar (fig. 408).—A fast-growing tree, forming handsome conical specimens on well-drained warm soils, but the branches are brittle and easily stripped from the trunk by strong winds. There are several varieties in cultivation, the chief of which are *Lobbii*, also called *viridis*, dwarfer and of a brighter green; and *nana*, a very dwarf flat-headed bush of some 2 to 3 feet high. Japan and Northern China, 1845.

CUNNINGHAMIA *sinensis*.—A lofty tree, somewhat resembling an Araucaria in its aspect. Requires a well-drained light soil, and is only hardy in very favoured spots. It is so liable to be disfigured by storms and hard frosts that few good specimens of it exist in Britain. China, 1804.



Fig. 408.—*Cryptomeria japonica*: proliferous cones.

CUPRESSUS (including *Chamaecyparis* in part).—Shrubs or trees with closely-appressed scale-like leaves, and spherical or oblong strobiles. We limit our selection to the hardier kinds.

C. Lawsoniana.—This is one of the hardiest and most ornamental of Conifers, seeding freely in this country, and giving birth to innumerable slight varieties. In its native country it grows from 80 to 100 feet high. In a young state its crowded, slender, drooping feathery branchlets are very elegant. One of the best and most distinct varieties is that called *erecta viridis* (fig. 409). The following names indicate the nature of the varieties they designate: — *compacta*, *laxa*, *lutea*, *gracilis*, *gracilis aurea*, *glauca stricta*, *nivea*, *minima*, *juniperina*, and *pendula vera*. Other handsome forms are *intertexta*, *Fraseri*, *Alumi*, and *darleyensis*. Upper California, 1855.

C. Macnabiana (*C. glandulosa*).—A shrubby species, from 10 to 15 feet high. North California.

C. macrocarpa (*C. Lambertiana*).—Although killed in very severe winters, this is so very handsome and so well adapted for the south and west coast, that we recommend it for the situation indicated, and for elevated inland localities. It does exceptionally well near the sea. The variety *lutea* is a handsome yellow-leaved form. Upper California, 1838.

C. nootkatensis (*Thuopsis borealis*) (fig. 410).—A fast-growing perfectly hardy tree, 80 to 100 feet high, densely branching, with slender drooping branchlets in the young state. North-western America, 1851.

C. thyoides (*Chamaecyparis sphaeroidea*), White Cedar.—A tree 30 to 60 feet high, with slender, not plaited branchlets. It is quite hardy, and flourishes best in wet ground. There are among others, a handsome variegated variety with yellow and green foliage, and one with very glaucous leaves. It inhabits the swampy parts of the United States of North America, 1736.

Ginkgo biloba (*Salisburia adiantifolia*), Maiden-hair Tree.—A hardy deciduous pyramidal tree, attaining a height of 50 or more feet. Its remarkable fan-shaped coriaceous leaves are very peculiar in this family. China and Japan, 1754.

JUNIPERUS.—The Junipers for the most part thrive best in humid localities, many of them becoming infested with the red spider when planted in dry situations. The common Juniper is an exception.

J. chinensis.—One of the most ornamental. It is dioecious, and the two sexes are very different in appearance, the male being the handsomer of the two. Both spreading and closely imbricated leaves are found on the same plant. Very hardy. Var. *aurea* is a beautiful form with foliage deep-yellow when young; *albo-variegata* has

the tips of its shoots frequently pure white. China and Japan, 1804.

J. communis, Juniper.—Varying in the different varieties from a trailing bush to a tree 50 feet high. Var. *alpina* is of dwarf trailing or ascending habit; *succica*, Swedish Juniper, is erect, with longer, more distant leaves than the type, of a yellowish-green tint; *ibernica*, Irish Juniper, is of dense conical outline with silvery foliage, and there is also a variegated variety of it; *pendula* has drooping branchlets. Northern hemisphere.

J. drupacea.—A very hardy ornamental shrub, 10 to 20 feet high, remarkable for its large, fleshy, dark-purple fruit, which is about an inch in diameter; leaves spreading. Asia Minor, 1854.

J. excelsa.—An arborescent species, of compact habit, with small subulate leaves. Western Asia, 1806. Not so hardy as others.

J. japonica.—A dwarf bushy species with bright, lively-green foliage, probably a mountain form of *J. chinensis*. Japan, 1860.

J. litoralis.—A charming dwarf species of dense compact growth, foliage silvery. Japan, 1893.

J. Oxycedrus, Prickly Cedar.—A small loosely-branched tree, with spreading sharp-pointed leaves and shining red berries. South Europe, introduced before 1739.

J. recurva.—A shrub, with pendulous branches, which will only succeed in humid localities. Mountains of India, 1830.

J. Sabina, Savin.—There are several varieties, as *cupressifolia*, with very slender branches and glaucous silvery



Fig. 409.—*Cupressus Lawsoniana erecta viridis*.



Fig. 410.—*Cupressus nootkatensis*.

foliage, *prostrata*, a trailing variety with dark green foliage and suitable for rock-work, and *tamariscifolia*. There is also a prettily variegated variety. Alps, 1548.

J. thurifera, Frankincense Juniper.—A pyramidal tree 80 to 40 feet high. South Europe, 1752.

J. virginiana, Pencil Cedar.—A shrub or tree attaining as much as 40 feet in height. The variety *glauca* has glaucous foliage; *humilis* is a dwarf, spreading form, with foliage of a reddish tinge; and *pendula viridis* has long slender, pendulous, dark-green branchlets. Of numerous other varieties the following are the most distinct:—*Bedfordiana*, branches long and slender; *dumosa*, dwarf and rounded; *Schottii*, of erect pyramidal form and with deep-green foliage.

LARIX.—Deciduous trees, whose bright-green colour is exceedingly beautiful in the spring. There are several species besides the common Larch in cultivation, but none of them exceed it in beauty.

L. europæa, Larch.—A native of the Alps of Europe. Nurserymen distinguish several varieties; *pendula* is described as one of the most desirable. Cultivated in Britain since 1629.

L. leptolepis.—This resembles the common Larch, but has not nearly the same value as a timber tree. Said to grow into a large tree in Japan, whence it was introduced in 1861. *L. pendula* and *L. occidentalis* are also in cultivation, but possess no particular merit; both are natives of North America.

LIBOCEDRUS.—Highly ornamental evergreen trees, with scale-like, closely imbricated leaves.

L. chilensis.—A rather tender tree, growing from 60 to 80 feet high in the Andes of Chili. 1848.

L. decurrens (*Thuja gigantea*).—This handsome lofty tree is of columnar habit, with a remarkably stout trunk, and dark-green glossy decurrent glaucous leaves. Mountains of California, 1853.

PICEA.—The Spruces differ from the Silver Firs (see **ABIES**) in having the needle-shaped leaves scattered all round the shoots, and in the cones being pendulous.

P. ajanensis.—A pyramidal tree of graceful habit, with leaves of a dark shining green above, very glaucous beneath. Japan, 1861.

P. alba, White Spruce.—A very hardy tree 40 to 70 feet high, resembling the common Spruce, but having shorter pale glaucous-green leaves, and cones scarcely exceeding 1½ inch in length. North America, 1700.

P. Engelmanni.—A handsome Spruce, of stiff habit, with rigid, pointed, slightly-glaucous leaves. In the variety *glauca* the colour of the leaves becomes a bluish-gray. North America, 1864.

P. excelsa, Norway Spruce.—One of the very best of evergreen trees for all except very dry, poor, or very stiff soils, and very exposed situations. Its rich dark-green foliage renders it equal in beauty to any of the family. The varieties are exceedingly numerous, and some are very grotesque. *Clanbrassiliana* and *pygmæa* are dense dwarf bushes, rarely exceeding 2 or 3 feet in height; *monstrosa* has long spreading branches, with few lateral shoots, and has a strikingly weird aspect.

P. Morinda (*P. Smithiana*).—A very ornamentalspecies, with the young spray drooping; it is liable to be cut by spring frosts when quite young. Mountains of Northern India, 1818.

P. nigra, Black Spruce.—Scarcely equal to *P. excelsa* as an ornamental tree. Var. *rubra* is a dwarf form with redder bark and cones. North America, 1700.

P. Omorica, Servian Spruce.—A recent introduction of much promise, described as a tree of large size. The leaves on young seedlings are green and needle-like, but on adult specimens are flat and glaucous beneath. Servia, 1885.

P. orientalis.—A handsome, compact tree, of a more cheerful hue than the common Spruce. It also thrives much better on sandy soil. Asia Minor, 1825.

P. polita.—A very distinct and handsome species. Its stiff, robust branchlets are covered with a yellowish bark, the leaves being very rigid and dark-green. One of the best Japanese Conifers for planting on lawns. 1861.

P. pungens (*P. Parryana*).—A species with orange-coloured bark and sharply-pointed leaves, frequently confounded with *P. Engelmanni*. The varieties *glauca* and *argentea* are of a singularly beautiful silvery-blue colour. All the forms are perfectly hardy. California, &c., 1864.

P. sitchensis (*P. Menziesii*).—A very hardy species 50 to 100 feet high, but, unless grown in a moist position, it loses its leaves early, and presents a bare appearance. North California, 1832.

PINUS.—This genus, as limited here, consists of evergreen trees with needle-shaped leaves invested at the base with a membranous sheath. The number in each sheath is so far constant in different species as to furnish a sectional character; and as this character is easily seen we make use of it here.

§ 1. Leaves usually Two in each Sheath.

P. densiflora.—A desirable hardy species, from the northern parts of Japan. It has very small clustered cones. A near ally of the Scotch Pine.

P. Laricio, Corsican Pine.—A tall, erect, quick-growing species, with usually twisted leaves 4 to 6 inches long. Corsica, 1759. Var. *austriaca* or *nigricans*, Austrian Pine, 60 to 120 feet high, with dark-green leaves about 4 inches long. A valuable tree for shelter and for planting in exposed situations. Styria, 1835. Other varieties are:—*pygmæa*, a dwarf bush with short leaves, *Karamana*, intermediate in aspect between *pygmæa* and *austriaca*.

P. montana (*P. Pumilio*).—A small tree or shrub. The variety *nana*, called the Knee Pine, does not grow more than 2 or 3 feet high. *P. Mugho* also belongs here. Mountains of Europe, 1779.

P. Pinaster (*P. maritima*), Cluster Pine.—This is of irregular growth, with leaves 6 inches to 1 foot long, and clustered woody cones. It attains a height of 60 to 80 feet. A valuable tree for planting in exposed situations near the sea.

P. Pinea, Stone Pine.—A small round-headed tree 20 to 30 feet high, of very striking aspect. It is often represented in Italian views. It makes few roots, and is consequently difficult to transplant. Mediterranean region, 1548.

P. sylvestris, Scotch Pine.—A dense-growing tree with glaucous foliage; is not so handsome when young, but it makes a grand tree when old. A common European forest tree, wild in Scotland. Var. *aurea* turns a deep-yellow in autumn, but is green during spring and summer.

Other hardy Pines of this section are *P. Laricio* var. *Pallasiana* (*taurica*), from Siberia, and *P. mitis*, *inops*, and *resinosa*, from North America.

§ 2. Leaves usually Three in each Sheath.

P. Bungeana, the Lace-bark Pine.—A distinct and handsome species with smooth, peeling bark. The stiff, sharply-pointed bright-green leaves are between 3 and 4 inches long. North China, 1840.

P. Coulteri (*P. macrocarpa*), Large-coned Pine.—This is of very robust growth, with glaucous leaves 9 to 12 inches long, and cones a foot long. It attains a height

of 80 to 100 feet, and even in its early stages has a majestic aspect. Mountains of California, 1832.

P. insignis (*P. californica*).—A handsome Pine, with rich deep-green twisted foliage. In valleys or damp situations it is killed in severe winters, and small plants need protection; but it is nevertheless an indispensable Conifer for the sea-coast and well-drained soils. California, 1833.

P. monophylla (*P. Fremontiana*).—A small tree, with rigid leaves 2 to 3 inches long. On young trees the leaves are solitary, distinguishing this from any other Pine. California, 1847.

P. ponderosa (*P. Benhamiana*).—A large tree forming immense forests in the Western United States. The branches are somewhat distant on the main stem, which, together with the comparatively short duration of the leaves, gives the tree a rather bare appearance. It is, nevertheless, a striking and characteristic Pine. 1827. *P. Jeffreyi* is very similar to this.

P. rigida, Pitch Pine.—A variable tree according to situation, quite hardy and of vigorous growth when young. Eastern United States, 1750.

P. Sabiniana.—A tree attaining 40 to 100 feet in height in its native country; the leaves very long, glaucous. Said to be tender in some localities, but we believe it is quite hardy, except perhaps in the coldest parts of Britain. California, 1832.

§ 3. Leaves usually Five in each Sheath.

P. Ayacahuite.—A somewhat tender, very handsome Pine, similar to *P. Strobilus*, but with twisted cones over 1 foot long. Mexico.

P. Cembra, Siberian Stone Pine.—The Siberian form of this is rather slow-growing, but the Swiss form grows from 50 to 80 feet high. The variety *pygmaea* is extremely diminutive, attaining, it is affirmed, a height of only 5 or 6 feet in a hundred years. The leaves are short and closely appressed to the stem, and, like most of the following, of a glaucous hue. Introduced 1746.

P. excelsa, Bhotan Pine.—A handsome slender tree with loose foliage of a silvery-gray colour. This is perhaps the most desirable species of this section, being a rapid grower, and freely producing its ornamental cones. Mountains of Northern India, 1823.

P. flexilis.—A slow-growing tree with wavy branches and short rigid leaves. Mountains of California, 1863.

P. Lambertiana, Sugar Pine.—One of the loftiest, reaching in its native state a height of 200 feet. Its leaves are 4 to 5 inches long and the cones $1\frac{1}{2}$ foot long. California, &c., 1827.

P. Montezumae.—A long-leaved Mexican Pine, only hardy in the extreme south-west. 1837.

P. monticola.—A compact, conical, and hardy tree, resembling *P. Strobilus*, but denser, with shorter lighter-coloured leaves, which are silvery when young. Northern California, 1831.

P. Strobilus, Weymouth Pine.—A tall tree, producing the wood known as white pine. As a young tree it is remarkably ornamental, but loses its beauty with age. The bark of this species is quite smooth, and of a pale ash-gray. North America, 1705.

PODOCARPUS.—This genus belongs to the same group as the Yew, and has similar foliage. The fruit is fleshy and drupoid. The two species mentioned are hardy in the southern parts of the country only.

P. alpina.—A low spreading shrub, with slender branches and finely-pointed dark-green leaves about $\frac{1}{2}$ inch long. Tasmania.

P. chilina.—An interesting and handsome small tree, with dark-green narrow leaves 2 to 3 inches in length. Chili and Peru, 1853.

PRUMNOPITTS *elegans* (*Podocarpus andina*).—A small pyramidal tree or shrub, with coriaceous glossy leaves in two rows and about an inch long. Southern Chili, 1860.

PSEUDOLARIX *Kampferii* (*Larix Kampferii*), the Golden Larch.—Where it succeeds, this is by far the most beautiful of all Larches. It has much the same character of growth as the common one, but the leaves are larger; in spring the foliage is bright yellowish-green, and again in autumn it assumes a bright-golden colour. China, 1846.

PSEUDOTSUGA *Douglasii* (*Abies Douglasii*).—The Douglas Fir is a lofty, handsome tree reaching a height of 200 to 300 feet in a wild state. The leaves are of a deep, vivid-green, and over 1 inch long. Cones 2 to 3

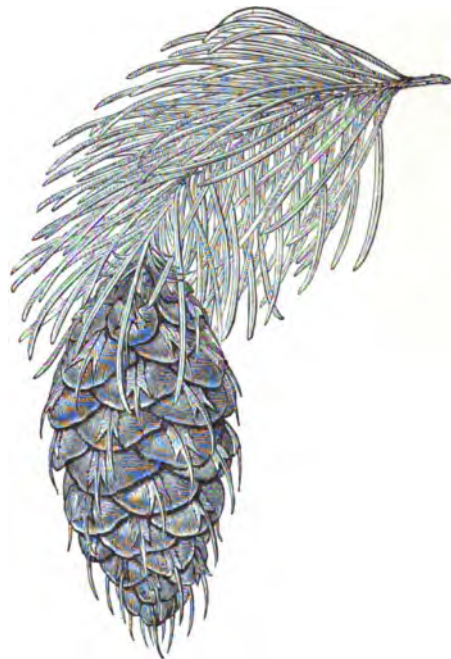


Fig. 411.—Cone of *Pseudotsuga* (*Abies*) *Douglasii*

inches long, pendulous (fig. 411). Some of the finest specimens in this country have already attained 120 feet in height. The variety *taxifolia* has longer leaves and is of dwarfer, denser habit. North America, 1827.

RETINOSPORA.—As a convenient arrangement for garden purposes we retain this genus here, although it is not now recognized by botanists. With the exception of *obtusa* and *pisifera* those here mentioned are really forms of growth of various species of *Cupressus* and *Thuja*, to whose normal characters they may eventually revert. The following kinds comprise some of the most beautiful and elegant of all dwarf Conifers.

R. ericoides.—A dwarf, compact, conical bush with small, pointed leaves which assume a ruddy tint in winter. It is a form of *Thuja orientalis*, in which the characters of the original seed-leaves are retained.

R. filifera (fig. 412).—A very distinct plant, with long, thread-like pendent branchlets. There is a golden variety in cultivation. A state of *R. obtusa*.

R. leptoclada.—An erect-growing compact shrub, with

glaucous-green, imbricated foliage. This is a state of *Cupressus thyoides*, amongst a batch of seedlings of which it was first noticed.

R. obtusa (*Cupressus obtusa*).—Described as a tree 60 to 100 feet high. It has closely-imbricated, obtuse,



Fig. 412.—*Retinospora filifera*.

tubercled leaves, of a deep-green in exposed parts, silvery below and where shaded. *Aurea* and *argentea* are prettily variegated varieties; and *pygmaea* (*Thuja pygmaea*) is a miniature form. Japan, 1850.

R. pisifera (*Cupressus pisifera*).—A desirable small tree, with slender, feathery, light-green branchlets, and scale-like, very sharp-pointed, imbricated leaves. Var. *aurea* is variegated with gold, and *argentea* has silvery foliage. Japan, 1850.

R. plumosa.—The forms under this name belong to *R. pisifera*. They are exceedingly beautiful in a young state. The variety *argenteo-variegata* has soft silvery and pale-green acicular leaves and very slender branchlets. Japan, 1850.

R. squarrosa.—This is also a state of *R. pisifera*. It is a dense shrub with pale glaucous foliage, and is one of the most ornamental of this set of *Retinosporas*, characterized by short, needle-shaped leaves.

SAXE-GOTHEA conspicua.—A small tree with Yew-like foliage, from the mountains of Patagonia, and too tender for our climate generally. 1845.

SCIADOPITYS verticillata, Umbrella Pine (fig. 413).—A lofty hardy evergreen tree 50 to 150 feet high. Leaves 2 to 4 inches long and about a sixth of an inch broad, whorled. A strikingly beautiful tree. Mountains of Japan, 1861.

SEQUOIA.—Gigantic evergreen trees, with linear, spreading or scale-shaped and imbricated leaves, and small cones. The two species rank with the largest trees known.

S. gigantea (*Wellingtonia gigantea*), Mammoth Tree.—The largest and tallest tree of the northern hemisphere, and, with the exception possibly of some of the Gum-trees

of Australia, of the whole world. It was first discovered in 1850, and was introduced by William Lobb three years later. The largest specimens whose measurements have been authenticated had attained a height of a little over 320 feet, with a girth outside the bark of 90 feet at 6 feet from the ground. Estimates as to the age of the oldest trees range between 2000 and 3000 years. It has proved hardy in the greater part of the British Isles, and in favoured spots in Ireland has already reached a height of 80 feet. It should be planted when young in a sheltered and permanent position, as it resents transplanting when once established. Sierra Nevada, Upper California.

S. sempervirens (*Taxodium sempervirens*), Redwood.—This, although not so colossal in its proportions as the other, attains the height of from 200 to 300 feet. It is scarcely so hardy as *S. gigantea*, though it thrives very well and grows rapidly in thoroughly drained soils. In aspect it is very different, the leaves being linear, about half an inch long, and spreading in two ranks. California, 1843.

TAXODIUM distichum, Deciduous or Bald Cypress.—One of the few deciduous Conifers. It forms a handsome tree, sometimes exceeding 100 feet in height, with linear leaves in two ranks, variable in length. It succeeds best in sheltered situations in a moderately rich moist soil. In moist ground it sometimes develops knee-like humpy roots which project a foot or two above the ground. North America, 1640. The variety *pendula* (*Glyptostrobus pendulus*) is a beautiful slender tree with extremely



Fig. 413.—*Sciadopitys verticillata*.

fine pendulous branchlets, the leaves being at first closely pressed to the stem.

TAXUS.—The Yews may be known by their bright-coloured fleshy-cupped fruit. Much difference of opinion exists as to the number of good species.

T. adpressa.—Of doubtful origin, and referred by

different botanists to different species. It is a low spreading tree, wider than high, with small dark-green leaves arranged in double rows. Supposed to be of garden origin. A very ornamental plant and well suited for small gardens.

T. baccata, Yew.—One of the hardiest and most useful of evergreens, attaining great age, and the dimensions of a small tree, but in the shrubby form exceedingly valuable for hedges and close screens. The varieties of it are very numerous, and many are highly ornamental. One of the most familiar is the narrow upright-growing *fastigiata*, or Irish Yew; *cheshuntensis* is intermediate in habit between the common and Irish; *Dovastoni* has pendulous branchlets; *nana* is a very dwarf-growing variety; *fructo-lutea* bears yellow fruit; *erecta* and *pyramidalis* throw up numerous slender stems from the base. To these we may add the variegated varieties *aurea* and *elegantissima*, which are very effective in cool, half-shaded places. There is also a variegated variety of the Irish Yew, in which some of the leaves are striped with white. Several other named varieties are grown in nurseries.

T. canadensis, Ground Hemlock.—A straggling bush, with shorter leaves than the common Yew, of which it is perhaps a variety. North America, 1800.

T. cuspidata.—A handsome bushy Yew, with dark-green leaves of a tawny colour beneath and terminating in a spiny point. Japan.

THUJA (including *Thujopsis* and *Biota*).—Evergreen trees, quite hardy and very ornamental. They thrive in almost any soil, provided it is moist and not too sandy. Some of them change to brown during winter, regaining their green colour in spring.

T. dolabrata (*Thujopsis dolabrata*).—This forms a large ornamental tree in Japan, and is hardy in the south of England. It is readily recognized by its appressed, flattened, hatchet-shaped shining leaves, with silvery lines on the under side. Its mode of branching is also quite peculiar. A cool soil appears to suit it best. The variety *variegata* has the spray here and there coloured with creamy yellow; and *nana* is of very dwarf habit. 1854. *T. latevirens*, properly a variety of this, with slender branches resembling those of a Lycopodium, is a beautiful shrub, with a broad, densely conical habit, and tiny leaves of a warm green. It is not, however, so robust and hardy as *T. dolabrata*. Japan, 1861.

T. gigantea (*T. Menziesii*, *T. Lobbii*) (fig. 414).—This handsome fast-growing tree has crowded, slender branchlets; leaves glossy-green above, silvery beneath, not tubercled as in the other species. It is well fitted to form a screen for more tender plants, and from its somewhat fastigate growth may be planted closely in rows. Rocky Mountains, 1854.

T. japonica (*T. Standishii*).—An ornamental shrub of erect conical habit, densely furnished with slender branches, the leaves closely imbricated, and of a pale or yellowish green. Japan, 1861.

T. occidentalis, American Arbor-vitæ.—This may be known by the tubercles on the closely imbricated leaves. It includes several forms, amongst them the Siberian Arbor-vitæ, *T. o. sibirica* (*Wareana tatarica*, &c.), which forms a compact, conical, densely-branched bush, in which the leaf tubercles are less prominent; *plicata*, remarkable for the twisted branchlets being in pairs; *pendula*, which has drooping branches with tufts of branchlets at their extremities; *cristata*, a similar form; *pumila*, *minima*, and *compacta*, dwarf bushy varieties; *Vervœneana*, which changes to a golden-brown in winter. North-eastern America, 1596.

T. orientalis (*Biota orientalis*).—Chinese Arbor-vitæ.—

Very variable, comprising many highly ornamental shrubs, of which the following are some of the best:—*aurea*, the golden Arbor-vitæ; *japonica*, of conical outline, retaining its bright-green all through the winter; *elegantissima*, of erect slender habit, the young growth beautifully flushed with yellow; *compacta*, small in stature, with slender



Fig. 414.—*Thuja gigantea*.

branchlets; *semperæurens*, with the dwarf habit of *aurea*, but retaining its yellow hue all the year round; *pendula* (*flagelliformis*), having long pendulous flexible branchlets; *meldensis*, a peculiar form, with linear spreading leaves. The typical form is one of the handsomest of the genus. China, 1752.

TORREYA.—A North American and East Asiatic genus of shrubs or trees, with regular whorled branches, in foliage resembling the Yews, to which they are closely allied. The fruit, however, is much larger, and destitute of the fleshy cup which characterizes the latter genus. When bruised they emit a very powerful and unpleasant odour, *T. grandis* excepted, and are called Stinking Yews by the Americans.

T. californica (*T. Myristica*), Californian Nutmeg.—A small round-headed tree from 20 to 40 feet high, with very sharp-pointed two-ranked leaves about 2 inches long, and oblong green fruits resembling a nutmeg when cut across. Mountains of California, 1848.

T. grandis.—This is quick growing, and forms an exceedingly handsome tree. The leaves are devoid of unpleasant odour, are less than an inch long, glossy dark-green above and silvery beneath. Northern China.

TSUGA.—The species brought under this name are often referred to *Abies*, but if we keep *Abies* distinct from *Picea*, it is as well to separate *Tsuga* from *Abies*. They have linear leaves and very small cones.

T. canadensis, Hemlock Spruce.—A tree from 50 to 80 feet high, with slender pendulous branches, having leaves light-green above, silvery beneath. A very hardy, fast-growing, and graceful tree, succeeding well in damp and rather shady situations. North America, 1736.

T. Mertensiana (*T. Albertiana*, &c.).—Similar to the last, but the leaves are shorter and more slender, and the branchlets are hairy. North America, 1858.

T. Pattoniana.—A large tree in its native country. In a young state it has the aspect of a Juniper, the leaves being linear and pointed. It is very hardy, and forms an erect densely-branched shrub. North America, 1853. What is known as *T. Hookeriana* in gardens is a variety of this with shorter and more glaucous leaves.

T. Sieboldii (*Abies Tsuga*).—A very handsome small tree somewhat resembling the Yew, but with foliage of brighter green, and marked underneath with two silvery lines. Japan, 1853.

III. SEA-SIDE AND TOWN TREES AND SHRUBS.

SEA-SIDE PLANTING.

The injury caused by strong sea-winds and salt spray to most kinds of trees and shrubs is well known. The contiguity of the sea is in itself a great benefit to most types of vegetation, owing to the moderating influence it has on the temperature. This is plainly shown in sheltered sea-side gardens such as are to be found in considerable numbers along the south coasts of Devon and Cornwall. Here many of the plants that require a cool greenhouse even as far south as London, can be grown permanently out-of-doors without any protection. As far north as Oban the same influence of the sea is discernible; and in sheltered situations, even in the islands of Skye and Lewis, as well as in the Orkney Islands, many plants considered tender in inland localities thrive perfectly. It is when the situation is exposed to winds coming directly from the sea that the problem of selecting suitable trees and shrubs arises—such, for instance, as the promenades and sea-fronts of nearly all watering-places. The plants which can be included as specially adapted to positions like those just mentioned may be divided into two

groups:—1. Those that have the power to resist the direct effects of strong salt-laden winds; and 2. those that will only withstand the same effects in a lesser degree, and when slightly screened or sheltered.

In planting sea-side gardens the first group will have to be drawn upon to furnish screen or shelter plants—those, in other words, that are able to bear the brunt of the storm. To the leeward, or rather inland side, those of the second group may be used. The trees and shrubs that come under these two groups are given in the subjoined tabulated lists A and B. They are arranged as nearly as can be ascertained in the order of their power of resisting the effects of the sea-breeze:—

A.—Trees and shrubs that withstand the sea-breeze.

DECIDUOUS SHRUBS.

Hippophæ rhamnoides.

Ulex europæus.

Tamarix gallica. A most valuable screen plant, extensively employed on the south coast. It thrives well in fully exposed situations on the Firth of Forth. *T. tetrandra* and *T. chinensis* may be used in less exposed places.

Myricaria germanica.

Sambucus nigra. Forms an efficient screen-fence on poor soil if pruned twice or three times a year.

Lycium europæum and *L. barbarum*. May be employed for covering an external fence. The latter is hardier.

Cytisus scoparius.

Berberis vulgaris.

Rhamnus cathartica.

Juniperus communis.

Ribes sanguineum.

Symphoricarpos racemosus.

Corylus Avellana.

Rosa spinosissima; *R. rubiginosa*.

Ceanothus americanus.

Hydrangea Hortensis.

EVERGREEN SHRUBS.

Euonymus japonicus and its several varieties.

Veronica decussata. Reported by Mr. Gorrie as free and symmetrical, growing in a position fully exposed to the sea-winds and salt-water spray on the island of Rousay in Orkney.

Ilex Aquifolium crassifolia, *I. A. scotica*, *I. A. Hodginali*, and generally the thick-leaved varieties.

Hedera Helix, *H. canariensis*, *H. algeriensis*, *H. Rognieriana*, and other varieties. May be grown over a pile of rough stones or a tree-root, and will assume the character of a distinct and branching evergreen, in positions unsuited

for the growth of laurels and other broad-leaved evergreens.

Rhododendron catawbiense, *R. ponticum*, and most of the thick-leaved kinds.

Chenopodium fruticosum.

Bupleurum fruticosum.

Escallonia macrantha, *E. pterocladon*.

Cotoneaster microphylla, *C. Simonsii*.

Atriplex Halimus.

Berberis Darwinii; *B. empetrifolia*, *B. Aquifolium* (*Mahonia*).

Quercus Ilex.

Crategus Pyracantha.

Rhamnus Alaternus.

Phillyrea media, *P. angustifolia*, *P. latifolia*.

TREES.

Salix Caprea, *S. cinerea*, *S. alba*, *S. rubra*, *S. viminalis*. These are all good as screen plants.

Pyrus communis. Useful to form a strong fence in exposed places.

Pyrus Aucuparia.

Acer Pseudo-Platanus.

Ulmus montana.

Pinus austriaca, *P. Laricio*, *P. Pinaster*, *P. Pumilio*. On the south coast *Pinus insignis*, *P.*

muricata, *P. Inopa*, and *P. contorta* do well.

Crategus Oxycantha.

Betula alba.

Pyrus Sorbus.

Fraxinus excelsior.

Laburnum alpinum. Has much greater power of endurance than the common variety.

Carpinus Betulus.

Fagus sylvatica.

Populus canescens.

Alnus glutinosa.

B.—Trees and shrubs that withstand the sea-breeze when slightly screened or partially sheltered.

DECIDUOUS SHRUBS.

<i>Syringa vulgaris</i> .	<i>Colutea arborescens</i> .
" <i>persea</i> .	<i>Philadelphus coronarius</i> .
<i>Ligustrum vulgare</i> .	<i>Azalea pontica</i> .
" <i>ovalifolium</i> .	<i>Spartium junceum</i> .
<i>Viburnum Opulus sterile</i> .	<i>Cytisus albus</i> .
<i>Fuchsia magellanica</i> .	<i>Spiraea</i> , many varieties.
" <i>Riccortoni</i> .	<i>Dentzia crenata</i> .
<i>Diervilla rosea</i> .	<i>Buddleia globosa</i> .
" <i>amabilis</i> .	<i>Leycesteria formosa</i> .
<i>Cornus sanguinea</i> .	

EVERGREEN SHRUBS.

<i>Rhododendron</i> , hybrid and al- pine varieties.	<i>Laurus nobilis</i> .
<i>Arbutus Unedo</i> .	<i>Eleagnus argentea</i> .
" <i>Andrachne</i> .	<i>Cerasus Laurocerasus</i> .
" <i>procera</i> .	<i>Griselinia littoralis</i> .
<i>Taxus baccata</i> .	" <i>lucida</i> .
<i>Viburnum Tinus</i> .	<i>Olearia Haastii</i> .
<i>Ilex Aquifolium balearica</i> (<i>maderensis</i>).	<i>Daphne Laureola</i> .
<i>Ilex Aquifolium angustifolia</i> .	<i>Garrya elliptica</i> .
" <i>laurifolia</i> .	<i>Buxus sempervirens</i> .
" <i>variegata</i> .	" <i>balearica</i> .
<i>Fernettia mucronata</i> .	<i>Aucuba japonica</i> and its varieties.
<i>Cerasus lusitanica</i> .	<i>Ligustrum japonicum</i> .
<i>Baccharis halimifolia</i> .	<i>Andromeda floribunda</i> .

DECIDUOUS TREES.

<i>Acer platanoides</i> .	<i>Cerasus Avium flore-pleno</i> .
<i>Platanus orientalis</i> .	<i>Populus alba</i> .
<i>Laburnum vulgare</i> .	" <i>nigra</i> .
<i>Pyrus Malus prunifolia</i> .	" <i>tremula</i> .
<i>Prunus Padus</i> .	<i>Quercus</i> , various.

EVERGREEN TREES.

<i>Cupressus Lawsoniana</i> .	<i>Picea pectinata</i> .
" <i>macrocarpa</i> .	" <i>Pinapo</i> .
" <i>nootkatensis</i> .	" <i>nobilis</i> .
<i>Araucaria imbricata</i> .	" <i>concolor</i> .
<i>Picea Nordmanniana</i> .	<i>Thuja occidentalis</i> .

Among deciduous trees the Mountain Ash (*Pyrus Aucuparia*), the Sycamore (*Acer Pseudo-Platanus*), and the Wych Elm (*Ulmus montana*), and among evergreen trees the species of *Pinus* named in list, have been found the most persistent. These trees, if planted in masses, grow freely, and maintain their shape even in positions of considerable exposure. Among shrubs, or trees that may be treated as shrubs, the Sea Buckthorn (*Hippophæ rhamnoides*) grows freely within a few yards of high-water mark, where it is liable to be drenched by the salt spray of every storm. Placed less near to the sea-margin the Goat Willow (*Salix Caprea*) shows great powers of endurance. In a like situation the Elder (*Sambucus*) grows vigorously, and though some of its young shoots are liable to be killed during winter these are speedily concealed by the exuberant growth of the following season. On the south coast, as at Brighton, a double or even a single row of Tamarisks, planted closely together, is employed with great success in exposed situations. They are found to thrive in positions where even the Sycamore

suffers greatly; *Euonymus japonicus* is also employed with success as a screen towards the sea in many places on the south coast. Good results have been obtained with Holly, less satisfactory with Yew, Laurustinus, and Laurel, the common Laurel being less persistent than the Portugal Laurel. Most of the ornamental Hollies need some shelter. The *Araucaria* and the varieties of Cypress named in the preceding lists grow vigorously with only the shelter of a border screen such as described.

Certain common trees, such as the Lime, the Horse Chestnut, the Scotch Fir, and the Spruce are not suited for planting in exposed sea-side positions. The Willows (*Salix*) mentioned in the preceding list are specially serviceable. Between Blackpool and Southport *S. alba*, *S. rubra*, &c., are extensively planted in belt-lines to protect other trees and shrubs from the winds that sweep along that part of the coast with unusual severity. They not only grow rapidly—reaching heights of 20 to 30 feet in three or four years—but they thrive in poor sandy soil. As evergreen hedge-plants in the south and south-west coasts, the Escallonias are remarkably fine. *Lavatera arborea* (tree-Mallow) is a biennial, but on the southern coasts, where it has become naturalized, it attains a height of from 8 to 12 feet the second year. It will grow on the very edge of the sea, and thickly planted belts of it are sometimes used for screening garden crops from direct sea-blasts. *Lycium barbarum* is another useful fence plant for sea-side situations. At some sea-side resorts, Cromer, for instance, it is very commonly used for fields, gardens, &c., quite close to the sea.

For small places a screen border of 20 feet in breadth is desirable, and still broader if the amount of ground can conveniently be spared. Such a border may be planted externally with a selection of the trees and shrubs enumerated in the first portion of the list A, and internally with a selection of the denser-growing evergreens from that list and the list B. In cases where the external border or screen needs to be made quite narrow a row of Tamarisks or of *Euonymus* planted closely together will be found very suitable for the more sunny localities, and for those less favoured by sunshine the Sea Buckthorn, the Goat Willow, and the Elder, kept to the size of large shrubs, will do excellent service.

In planting specimen trees of the less persistent kinds full advantage should be taken of minute local circumstances that afford some shelter. The position, in reference to strong

LILACS

The Lilac (*Syringa vulgaris*) has been a favourite garden plant in Europe since the middle of the fifteenth century, when it was grown in a garden at Padua and elsewhere under the name of "Lilac". In its many forms it ranks among the most valuable of all shrubs for the open garden, and since it has been so much improved by cross-breeding and selection it has become almost as valuable as a conservatory plant. The principal raiser of these large vari-coloured and double-flowered forms is M. Lemoine of Nancy, who within the last twenty-five years has added many lovely varieties. The colours of the flowers are white, pink, rose-lilac, and red-purple, almost crimson. By forcing them in a high temperature in a dark place it is possible to get perfectly white flowers from the purple and lilac coloured varieties, and large numbers of plants are grown specially for forcing to supply flowers for the European markets, Paris and London alone requiring hundreds of thousands, the trade in "forced Lilac" being now a very important one. Some of the best varieties are Alba-grandiflora, Marie Legray, Charles X, Philamon, De Marly, Souvenir de L. Spath, Madame Lemoine, and rubra plena.





LILAC:—

1, ALBA GRANDIFLORA. 2, SOUVENIR DE LOUIS SPATH

winds, of a projecting rock, of a neighbouring building, or even of a single tree of the hardier sort, must not be overlooked. It frequently happens that a change of less than 50 feet in the position of a tree or shrub may make all the difference between rearing a well-formed shapely specimen, or one that is quite the reverse.

Besides the presence of saline matter in the air, the difficulty of establishing trees and shrubs in positions exposed to the fiercest storms that visit our islands has to be considered. The mistake frequently made in sea-side gardens, especially public ones, is in planting large specimens with a view to obtaining an immediate effect. Such trees become loose at the root before they have a chance to fix themselves firmly by getting a thorough hold of the new soil. Artificial supports (stakes, wires, ropes, &c.) will, of course, afford some help; but no ordinary staking will counteract the persistent swaying and twisting effects of the wind on a bushy tree or shrub of large size. Three or four years, during which many such trees will linger on, are often wasted in attempts of this sort, as well as all the attendant expenses. And at the end it is necessary to begin the work anew by using trees of smaller size.

Till the external screen recommended is well grown a protection of hurdles or rough boarding fixed on the external wall during the winter or windy season will be found of much advantage. Similar screens may also be employed for single plants or groups of plants within the grounds.

TREES FOR CHALK SOILS.

Chalk soils are often difficult to furnish with a thriving mantle of vegetation, and yet there are many situations on elevated chalk land which are exceedingly well adapted in other respects for residential purposes, and in which, as a consequence, planting becomes important.

The chalk districts of England do not vary much in their physical characters—bold, undulating hills of great breadth and extent, with open valleys, all much exposed to the action of the wind. The soil of these chalk hills and downs is very uniform, a thin crust of brown loam immediately overlying the pure chalk. Here and there on the highest hills and most elevated flats are a few patches of plastic clay, forming the basins of those perennial ponds which one sees on the South Downs, and which no drought can destroy. These clay patches

are very valuable and important in many ways. The chalk and the loam are very definite and sharp in the line where they meet; there is no mixing-up, no transition from one to the other; but the line of union is often irregular, for in a section it is sometimes seen that the loam will be only 5 or 6 inches deep at one spot, and 2 or 3 feet at another close by.

Chalk consists almost entirely of carbonate of lime, with some silica and a trace of alumina. It therefore very imperfectly supplies the mineral elements necessary for vegetable growth. The loam on chalk consists of carbonate of lime, some clay, sand, and a considerable quantity of decayed vegetable matter, and is, therefore, a fair supporter of vegetable life.

Trees of very large size will grow upon this thin layer of soil, as is evident to anyone who travels through the chalk cuttings on our southern railways. In many places the soil is not 6 inches deep above the chalk, and yet splendid trees, especially Beeches, are seen clothing the hills.

In trenching chalk land the trench should be carried to the bottom of the loam, but no further. However thin the layer of soil may be, it alone should be turned over. The chalk may be broken up into large lumps with a pick-axe, and left at the bottom of the trench.

The following trees and shrubs will thrive in a chalk soil:—

CONIFERÆ.

<i>Abies magnifica.</i>	<i>Pinus austriaca.</i>
„ <i>nobilis.</i>	„ <i>excelsa.</i>
„ <i>Nordmanniana.</i>	„ <i>Laricio.</i>
„ <i>Pinsapo.</i>	„ <i>Pinaster.</i>
<i>Cedrus atlantica.</i>	„ <i>sylvestris.</i>
„ <i>Deodara.</i>	„ <i>Torreyana.</i>
<i>Cupressus Lawsoniana.</i>	<i>Retinospora ericoides.</i>
„ <i>macrocarpa.</i>	„ <i>filicoides.</i>
„ <i>nootkatensis.</i>	<i>Sequoia gigantea.</i>
<i>Ginkgo biloba.</i>	<i>Taxus baccata.</i>
<i>Juniperus chinensis.</i>	„ <i>var. fastigiata.</i>
„ <i>communis.</i>	<i>Thuja Lobblif.</i>
„ <i>virginiana.</i>	„ <i>occidentalis.</i>
„ <i>Sabina.</i>	„ <i>orientalis.</i>
<i>Larix europæa.</i>	„ <i>tatarica.</i>
„ <i>leptolepis.</i>	„ <i>Wareana.</i>
<i>Picea excelsa.</i>	

DECIDUOUS TREES.

<i>Acer of sorts.</i>	<i>Fagus sylvatica var. purpurea.</i>
<i>Æsculus Hippocastanum.</i>	<i>Fraxinus excelsior.</i>
<i>Alnus glutinosa.</i>	<i>Gleditschia triacanthos.</i>
<i>Amelanchier canadensis.</i>	„ <i>sinensis.</i>
<i>Amygdalus communis.</i>	<i>Halimodendron argenteum.</i>
<i>Betula alba.</i>	<i>Kölreuteria paniculata.</i>
<i>Caragana of sorts.</i>	<i>Populus alba.</i>
<i>Castanea vulgaris.</i>	„ <i>and others.</i>
<i>Catalpa bignonioides.</i>	<i>Prunus Padua.</i>
<i>Cladrastus tinctoria.</i>	<i>Pyrus Aria.</i>
<i>Crataegus Oxyacantha.</i>	„ <i>Aucuparia.</i>
„ <i>and others.</i>	„ <i>Malus.</i>
<i>Cytisus Laburnum.</i>	„ <i>salicifolia.</i>
„ <i>and others.</i>	„ <i>spectabilis.</i>
<i>Fagus sylvatica.</i>	„ <i>and others.</i>

Quercus *Ilex*.
 " *Mirbeckii*.
 " *heterophylla*.
 " *Turneri*.
Robinia *Pseudacacia*.
 and others.

Salix *alba*.
 and others.
Tilia *vulgaris*.
Ulmus *americana*.
 " *montana*.
 " *glabra*.

SHRUBS.

Amorpha *fruticosa*.
Aralia *Sieboldii*.
 " *chinensis*.
Berberis *Aquifolium*.
 and others.
Buddleia *globosa*.
Calycanthus *floridus*.
Ceanothus *azureus*.
Cerasus *Laurocerasus*.
 " *lusitanica*.
Cistus of sorts.
Colutea *arborescens*.
Cornus *alba*.
 " *Mas*.
Corylus *Avellana*.
Cotoneaster of sorts.
Crataegus *Pyracantha*.
Deutzia *crenata*.
 " *Fortunei*.
 " *gracilis*.
 " *scabra*.
Diervilla *amabilis*.
 " *rosea*.
Eleagnus *japonicus*.
Escallonia *macrantha*.
Euonymus *japonicus*.
Garrya *elliptica*.
Hamamelis *virginica*.
Hypericum *calycinum*.
Ilex *Aquifolium*.

Kerria *japonica*.
Lavandula *Spica*.
Leycesteria *formosa*.
Ligustrum of sorts.
Magnolia *glauc*.
Myrica *germanica*.
Philadelphus of sorts.
Phillyrea *ilicifolia*.
 " *buxifolia*.
Pyrus *japonica*.
Raphiolepis *ovata*.
Rhus *Cotinus*.
 and others.
Ribes *aureum*.
 " *sanguineum*.
Rosa *rubiginosa*.
 and others.
Spartium *juncum*.
Spiraea *aristifolia*.
 " *bella*.
 " *Lindleyana*.
 " *japonica*.
Tamarix *gallica*.
 " *chinensis*.
Viburnum *Opulus*.
 " *Tinus*.
Yucca *filamentosa*.
 " *gloriosa*.
 " *recurvifolia*.

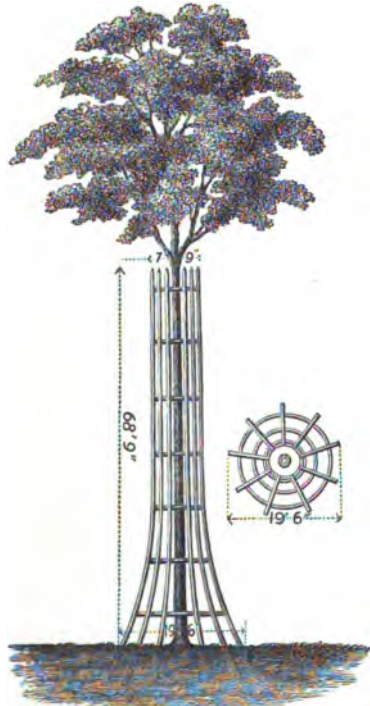


Fig. 414.—Tree-guard used in Paris.

To these may be added some climbing plants:—

Ampelopsis *Veitchii*.
Bignonia *radicans*.
Clematis.
Hedera.

Jasminum *nudiflorum*.
 " *officinale*.
Lonicera of sorts.

TREES FOR TOWNS.

Trees planted in towns, except where the open space of a square or a crescent will admit of their being grouped, necessarily follow the lines of

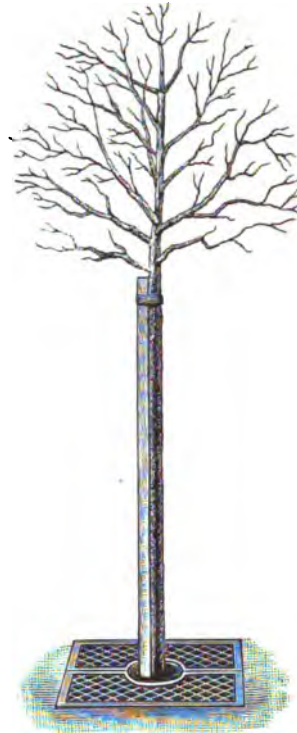


Fig. 415.

the streets, and constitute avenues, single or double, according to the available space. It is important that in these cases the avenues, or at least the corresponding lines on each side of the street, should consist of one kind of tree, otherwise the effect is not satisfactory.

In all cases good preparation should be made for the roots. Openings 6 or 7 feet across, and at least 3 feet deep, should be made, and filled in with good new soil, unless in the case of new lines of streets, where the ground is good, or has been made up with a mixture of earth of fair quality and such open material as brick rubble. Then, indeed, a smaller quantity of new soil may suffice to give the trees a start; but in all other cases there should be no stint of good fresh soil at the outset. The surface should be thoroughly mulched after planting the trees, if it can possibly be done, and the stems should without delay be protected by means of circular tree-guards (fig. 415). If these are not necessary a stout stake, preferably oak with the base soaked in creosote, should be

used, and the tree fastened to it firmly by means of a band of rubber or plaited straw. If the surface be a paved one, iron gratings should be laid around the stems, large enough to extend outwards from each tree for at least 3 feet in all directions, in order to admit air and moisture to the roots (see fig. 416).

The distance between each tree should be at least 40 feet. It is not desirable to plant in such a way as to necessitate the mutilation of the trees when large to prevent their interference with buildings or with each other. The chapter on *Pruning* should be read before any attempt at pruning is made. Street trees are too often spoilt by thoughtless "cutting in a bit" by an untrained workman.

The following lists of trees and shrubs for streets and town gardens have been supplied by Mr. William Goldring. From these lists selections can be made for any town in the British Islands. The more tender kinds are indicated.

A.—Trees for streets and avenues in towns.

Acer dasycarpum.	Platanus orientalis.
" macrophyllum.	Populus alba argentea.
† " platanoides.	Quercus Cerris.
" " var. Reitenbachii.	† Robinia Pseudacacia.
" " " Schwedleri.	† Tilia euchlora.
" Pseudo-Platanus.	† " platyphyllos.
† " " var. purpureum.	" petiolaria.
Æsculus Hippocastanum.	" argentea.
" " var. flore-pleno.	† Ulmus campestris virens.
Castanea vulgaris.	" " Wheatleyi.
Fraxinus pennsylvanica.	" " cornubiensis.
* Platanus acerifolia.	" " glabra vegeta.

* Does not grow well in northern or midland districts.
† These are the best for streets in large towns.

B.—Flowering trees for town parks, gardens, and squares.

a Æsculus Hippocastanum and vars.	b Halesia tetraptera.
b " carnea and vars.	c Koeleria paniculata.
c Amelanchier canadensis.	b Laburnum vulgare and vars.
c Amygdalus communis.	b " alpinum.
c " var. macrocarpa.	c Liriodendron tulipifera.
c " Davidiana alba.	b Magnolia conspicua.
c " Persica flore-pleno and vars.	b " Lenzii.
b Catalpa bignonioides.	c " Soulangeana.
b " speciosa.	c " glauca.
b Cerasus Avium flore-pleno.	b " tripetala.
c " Pseudo-cerasus.	b " Fraseri.
c " " var. Watereri.	b Paulownia imperialis.
c " " " Sieboldi.	b Prunus cerasifera.
b " Padua.	b " var. Pissardi.
b " serotina.	b " divaricata.
b " virginiana.	b Pyrus Aucuparia.
b " Mahaleb.	b " baccata.
b " semperflorens.	b " coronaria.
c Cotoneaster bacillaris.	c " floribunda and vars.
c " frigida.	c " Toringo.
c Cercis Siliquastrum.	c Rhus typhina.
c Crataegus Oxyacantha all vars.	c Robinia hispida.
c coccinea.	b " neo-mexicana.
c " Crus-galli and vars.	a " Pseudacacia.
c " Azarolus and vars.	a " var. Decaisneana.
c " Carrieri.	a " semperflorens.
c " tanacetifolia.	b " viscosa.
b Fraxinus Ornus.	a Sophora japonica.
	b Mespilus grandiflora.

a denotes trees of largest growth.
b " " medium "
c " " small "

C.—Deciduous trees for town parks, gardens, and squares.

Acer colchicum rubrum.	Liquidambar styraciflua.
" Lobeli.	Magnolia acuminata.
" Pseudo-Platanus.	Populus alba Bolleana.
" var. Leopoldi.	" nigra pyramidalis.
" " Prince Handjery.	" tremula.
" dasycarpum laciniatum.	" tremuloides var. pendula.
" Negundo albo-variegatum.	Pterocarya caucasica.
" " aureo-variegatum.	Pyrus Aria lutescens.
" platanoides Worleyi.	" lanata.
Allanthus glandulosa.	" salicifolia pendula.
Ainus cordifolia.	" pinnatifida.
" glutinosa laciniata.	Quercus Cerris argentea.
Betula alba.	" conferta.
" laciniata pendula.	" coccinea.
" pendula Youngi.	" palustris.
" purpurea.	" Mirbecki.
Carpinus Betulus.	" pedunculata.
Castanea vulgaris variegata.	" var. Concordia.
Cedrela sinensis.	" filicifolia.
Cladrastis tinctoria.	Salix alba.
Fagus sylvatica.	" elegantissima.
" var. asplenifolia.	" babylonica.
" " purpurea.	" incana.
" " " pendula.	Tilia cordata.
Fraxinus excelsior.	" vulgaris.
" var. aucubefolia.	Ulmus montana pendula.
" " pendula.	" var. Dampieri aurea.
Ginkgo biloba.	" " Louis Van Houtte.
Gymnocladus canadensis.	" campestris Roosevelti.
Juglans nigra.	" " variegata.
" regia laciniata.	Taxodium distichum.
Larix europæa.	

D.—Deciduous shrubs for town parks, gardens, and squares.

Æsculus macrostachya.	Kerria japonica.
Amorpha fruticosa.	" var. variegata.
Aralia mandchurica.	Leycesteria formosa.
Azalea, Ghent and mollis.	Magnolia stellata.
Berberis Thunbergii.	Nuttallia cerasiformis.
" vulgaris atropurpurea.	Pæonia Montan.
Calycanthus floridus.	Philadelphus coronarius.
" occidentalis.	" Gordonianus.
Colutea arborescens.	" grandiflorus.
Cornus alba Spathii.	" Lemoinei.
" sanguinea.	" microphyllus.
" Mas elegantissima.	Potentilla fruticosa.
" sanguinea variegata.	Prunus spinosa flore-pleno.
Corylus Avellana purpurea.	" sinensis.
Cotoneaster Simonsi.	" triloba.
Cydonia japonica.	Ribes aureum.
" Maulei.	" sanguineum.
Cytisus albus.	Rubus deliciosus.
" nigricans.	" odoratus.
" scoparius.	Sambucus nigra.
" var. Andreanna.	" var. variegata.
" præcox.	" " aurea.
Daphne Mezereum.	" " racemosa.
Deutzia gracilis.	Spiræa arguta.
" scabra Watereri.	" arisfolia.
Diervilla amabilis and varieties.	" Bumalda.
Euonymus europæus.	" confusa.
" latifolius.	" Douglasii.
Exochorda grandiflora.	" hypericifolia.
Foraythia suspensa.	" japonica.
" intermedia.	" Lindleyana.
" viridisissima.	" Noblesana.
Genista hispanica.	" opulifolia aurea.
" virgata.	" Thunbergii.
Hamamelis arborea.	Staphylea colchica.
Hedysarum multijugum.	Symphoricarpos racemosus.
Hibiscus syriacus and vars.	Syringa pernica alba.
Hydrangea paniculata grandiflora.	" " laciniata.
Hypericum calycinum.	" vulgaris, all vars.
" Moserianum.	Tamarix gallica.
" patulum.	Viburnum Opulus.
Indigofera Gerardiana.	" plicatum.

E.—Evergreen shrubs for town parks, gardens, and squares.

† <i>Aralia Sieboldi</i> .	† <i>Griselinia littoralis</i> .
<i>Arbutus Unedo</i> .	<i>Hedera arborescens</i> in var.
<i>Arundinaria japonica</i> .	<i>Ilex Aquifolium</i> , all vars.
* <i>Aucuba japonica</i> .	" <i>crenata</i> .
† <i>Azara microphylla</i> .	† <i>Laurus nobilis</i> .
<i>Berberis Aquifolium</i> .	<i>Ligustrum japonicum</i> .
" <i>buxifolia</i> .	" <i>ovalifolium</i> .
" <i>Darwini</i> .	" var. <i>elegantissimum</i> .
" <i>stenophylla</i> .	<i>Olearia Haastii</i> .
* <i>Buxus balearica</i> .	* <i>Osmanthus ilicifolius</i> .
" <i>sempervirens</i> and vars.	<i>Pernettya mucronata</i> .
<i>Cerasus lusitanica</i> .	* <i>Phillyrea latifolia</i> .
† <i>Cistus laurifolius</i> .	" <i>media</i> .
<i>Cotoneaster buxifolia</i> .	" <i>Vilmoriniana</i> .
" <i>microphylla</i> .	* <i>Rhamnus Alaternus</i> .
" <i>thymifolia</i> .	<i>Rhododendron catawbiense</i>
<i>Crataegus Pyracantha</i> .	and vars.
* <i>Daphne Laureola</i> .	" <i>ponticum</i> .
<i>Diplopappus chrysophyllus</i> .	* <i>Ruscus aculeatus</i> .
<i>Elaeagnus glaber</i> .	* <i>Skimmia japonica</i> .
" <i>pungens</i> .	* <i>Ulex europæus</i> .
† <i>Escallonia macrantha</i> .	<i>Veronica salicifolia</i> .
<i>Euonymus japonicus</i> .	† " <i>Traversi</i> .
" <i>radicans variegatus</i>	* <i>Yucca gloriosa</i> .
<i>Gaultheria Shallon</i> .	" <i>recurvifolia</i> .

Those marked * may be planted in smoky districts.
Those marked † suitable only for southern and coast gardens.

F.—Evergreen trees for country towns in open parks and spaces.

<i>Abies grandis</i> .	<i>Pinus Cembra</i> .
" <i>Pinsapo</i> .	" <i>excelsa</i> .
<i>Araucaria imbricata</i> .	" <i>Laricio</i> .
<i>Cedrus atlantica</i> .	" <i>Strobus</i> .
" <i>Deodara</i> .	<i>Pseudotsuga Douglasii</i> .
" <i>Libani</i> .	<i>Quercus Ilex</i> .
<i>Cupressus Lawsoniana</i> .	<i>Sequoia gigantea</i> .
" <i>nootkatensis</i> .	" <i>sempervirens</i> .
" <i>thyoides</i> .	<i>Taxus baccata</i> and vars.
<i>Juniperus chinensis</i> .	<i>Thuja gigantea</i> (Lobbi).
<i>Picea orientalis</i> .	" <i>occidentalis</i> .
" <i>pungens</i> .	" <i>orientalis</i> .
<i>Pinus austriaca</i> .	

[W. J. B.]

CHAPTER XXIV.

HARDY HERBACEOUS PERENNIALS.

THE HERBACEOUS BORDER—THE ALPINE GARDEN—THE WILD GARDEN.

I.—THE HERBACEOUS BORDER.

In no department of the garden has more distinct progress been made during the last twenty years than in that devoted to the cultivation of hardy herbaceous plants. An excessive use of what are known as bedding plants, and the consequent disparagement of hardier but less gaudy perennials, brought about a reaction in favour of the latter, with the result that where dozens of such plants were among garden favourites, hundreds are grown now. It must not, however, be supposed that bedding plants have not a distinct value in the garden. There are certain positions and uses for such plants as the "Scarlet Geranium"

Coleus, *Alternanthera*, *Heliotrope*, *Lobelia*, *Calceolaria*, &c., which could not well be filled by other plants. For instance, no plant will give such a continuous display of brilliant scarlet, pink, or white flowers as bedding Geraniums do. Any plant might become a bedding plant to its disadvantage, and yet when properly used be of first-class value. There are gardens in which beautiful displays of bedding plants are presented, and which are beautiful because they are used with taste.

The number and variety of hardy herbaceous plants, including alpine, now available for gardening in the open air, render the selection of suitable plants for almost any position comparatively easy. Whether the soil be heavy or light, peaty or chalky, swamp-like or elevated and fairly dry; whether the position be exposed or sheltered, shaded or open, worthy plants in variety may be found that will grow and flourish there if skill and knowledge are exercised in selecting and planting them. Many will thrive under diverse conditions. *Anemone japonica* is an excellent plant for a shady, moist situation under trees; it is equally valuable for a bed on the lawn exposed to full sunshine, and it is also one of the most useful plants for the herbaceous border.

The Herbaceous Border.—Where room can be afforded, a spacious border should be given up almost entirely to a collection of hardy perennials. Groups of such shrubs as *Roses*, *Daphnes*, *Kerria*, *Forsythia*, *Honeysuckles*, *Clematis*, *Spiræas*, *Deutzias*, &c., may be effectively mixed with the herbaceous plants in a large border. The position most suitable is one exposed to full sunshine all day, and sheltered on the north and east by trees or shrubs, or, failing these, a building or wall. Such a position would be perfect; but borders on each side of a walk, or on the west side of a building, or even cut in the open lawn, could be suitably made to serve both for effect and to supply the requirements of a collection of these plants. The border should be prepared with the same care and outlay as are expended on, for instance, borders for kitchen-garden plants. The soil should be thoroughly drained, trenched to a depth of 2 feet, and well manured. A good loam is the best of soils for a general collection of plants, but except where the soil is unsuitable for gardening, it is not necessary to do more than drain, trench, and manure before planting. To merely clear a border of shrubs or trees which have impoverished the soil, and



HERBACEOUS BORDERS AND BEDS
(Miss Sullivan's Garden, Fulham)

C.A.CARRIGER

plant it with a collection of hardy plants, would be to court failure. By applying the same common-sense principles to the preparation of the ground for these plants as to the preparation of a good kitchen-garden satisfactory results may be expected.

If the border is skirted by trees or shrubs it must be periodically freed from the encroachments of their roots. This is the one drawback to such a position, which in all other respects is the best. Although some authorities recommend the planting of the herbaceous border so that it will not require digging or renovating for years, in practice we find that it pays to lift the plants and re-trench and manure the border every second or third year. Unless this is done the strong-growing plants encroach on their weaker neighbours, often killing them outright. It is a bad practice to attempt to prevent this by cutting off with a spade all the outside of the clumps, as this means the destruction of the youngest and most vigorous portions in favour of the old and weakened. Such plants as Asters and Sunflowers, and even Lilies, are much better when lifted periodically and replanted. On the other hand, there are those which are best left undisturbed; for instance, Pæonies, Hellebores, and Phloxes are impatient of root-disturbance. The restriction of the roots of trees and shrubs would form a part of the operation of the periodical renovation of the border. Whether the plants are to be grown in borders, or in beds on the lawn, or in groups amongst shrubs, the same thoroughness in regard to preparation of the soil is desirable.

A word on staking will not be out of place, for on the neatness and appropriateness with which this is done in a very great measure depends the satisfactory appearance of a border of this sort. As a rule never stake unless support is absolutely required. In our opinion there is no operation in connection with the management of herbaceous plants in which discretion and knowledge are more essential than in this; nothing looks more unnatural than to see a procumbent plant tied up to a stake, and nothing worse than to see a strong stake placed where a slender one would do, or a stake obtruding itself on our notice, as it is sure to do if it be twice the height of the plant. That knowledge is absolutely essential in whoever allots the stakes to the different plants will, we think, be obvious when we say that the supports should be furnished in the early stages of growth so as to secure the young shoots

while perfectly erect, and prevent them from being blown about by the wind; since the partial dislocation that takes place in their falling down is almost sure to be completed in the attempt to render them amenable to any tying process afterwards.

The arrangement of the plants in a mixed border requires a knowledge of the plants themselves and of their requirements as to position and space. "It is here that we can show the true summer flowers at their best; but it is here, more than anywhere else, that the 'art of many sacrifices' must be put in practice. For the main spaces plants should be chosen of bold and striking beauty, but as a border of all large plants would have a kind of monotony, certain spaces, chiefly towards the front, but also running back in many parts among groups of taller things, should be planted with those of taller growth. The chief plants for such a border are Oriental Poppies, Pæonies, the boldest of the Irises, Day Lilies, herbaceous Spiræas, Enotheras, a few of the best Campanulas, Delphiniums, Lilies, three or four of the best perennial Sunflowers, the tall blue Sea Holly, Kniphofias, Mulleins, Thalictrums, Dahlias, Hollyhocks, and a few others. These are the plants that will form the great effects of the border. The nearer parts and some spaces between the taller growths should have groups of plants of lower stature, and yet of a somewhat bold form of foliage. Of these the broad-leaved Saxifragas and Funkias are among the best. Still dwarfer plants, such as Pinks and Pansies, are suitable for the extreme edge. Each kind of plant in the mixed border should stand in a bold group, and the groups, differing in size and shape according to the aspect of the plant, should follow one another in a carefully-arranged sequence of colour, keeping plants of a colour together, such as Mulleins with Enotheras, and Kniphofias with Oriental Poppy. In the case of the last-named it is convenient to actually intergroup the two kinds, for the foliage of the Poppies dies away early, and the blank space it would have left becomes covered by the later-growing leaves of the autumn-blooming Kniphofias (Tritomas). In practice it is perhaps best to exclude bulbous plants from the mixed border, as the disturbing of the ground occasioned by division of the plants and manuring is perilous to the bulbs. Exception should be made in favour of three common Lilies, *L. candidum*, *L. bulbiferum*, and *L. tigrinum*.

"Some families of plants, especially those

whose beauty is in infinite variety, may best be enjoyed in places almost by themselves, where the eye would be undisturbed by the consideration of other kinds of flowers. A garden of Lilies may be made of great beauty, the groups of Lilies appearing among dwarf and moderate-sized shrubs and hardy Ferns. The Pæony family is another example of a large range of summer flowers that deserves such treatment, in addition to their use in other places. A whole wealth of garden beauty exists in this one tribe alone, for, apart from those best known—namely, the double varieties of the old garden kind, the Chinese herbaceous, and the old tree Pæony—there are many other kinds, both species and their cultivated varieties, that are now happily available for garden use. We owe a great deal to the taste and labours of some of the Continental nurserymen, who have turned their attention to producing new and beautiful forms of tree and herbaceous Pæonies, while those at home have put at our disposal many good species invaluable for garden use. When they are better known, everyone who cares for good hardy flowers will wish to grow the delicate pale-yellow *Pæonia Wittmanniana*, the rosy-scarlet *P. lobata*, *P. hybrida* with its delicate foliage and brilliant flowers, also *P. Broteri* and *P. triternata*, two of the noblest as foliage plants.

"Many a beautiful garden-picture may also be made by the placing of quite a small number, or even a single example, of some stately plant in a quiet place by itself, such as a group of *Lilium giganteum*, with its noble flower-spikes and its broad glistening leaves. A group of this grand Lily in partial shade, and backed by trees or small shrubs, shows one of the stateliest forms that can be seen of a flowering plant of one year's growth.

"Such another example is offered by the Californian Tree Poppy (*Romneya Coulteri*), which, when well established, will grow in one season into a bush 7 feet high, and as much through. It is a remarkably beautiful plant, and to an eye trained to harmonies of colour, singularly pleasing in the relation of its large milk-white flowers and pale blue-green leaves. It delights in a sunny, well-sheltered place in a light soil.

"Old walls are easily made beautiful by sowing a few seeds of Wallflowers, Snapdragons, Red Valerian, and Rock Pinks, and even a heap of hungry sand will grow to perfection the handsome Lime Grass and the beautiful native Sea Holly."—(Miss Jekyll.)

I.—A selection of fifty perennials, 3 feet or more high, for the herbaceous border.

<i>Acanthus mollis</i> .	<i>Helianthus lactiflorus</i> .
" " var. <i>latifolius</i> .	" multiflorus major (single and double var.).
<i>Achillea Eupatorium</i> .	" <i>rigidus</i> .
<i>Aconitum Lycoctonum</i> .	<i>Inula glandulosa</i> .
" <i>Napellus</i> and var. <i>paniculatum</i> .	<i>Lathyrus latifolius</i> .
<i>Althaea ficifolia</i> .	" <i>rosea</i> .
" <i>rosea</i> .	" var. <i>albus</i> .
<i>Anemone japonica</i> .	" <i>rotundifolius</i> .
<i>Bocconia microcarpa</i> .	<i>Lychnis chalcadonica</i> .
<i>Campanula latifolia</i> .	<i>Malva Alcea</i> .
" <i>persicifolia</i> , both var.	<i>Meconopsis Wallichii</i> .
<i>Centaurea macrocephala</i> .	<i>Monarda fistulosa</i> .
<i>Cephalaria alpina</i> .	<i>Papaver orientale</i> .
" <i>tatarica</i> .	" var. <i>bracteatum</i> .
<i>Cimicifuga racemosa</i> .	<i>Pentstemon barbatus</i> .
<i>Delphinium cardinale</i> .	<i>Phlox decussata</i> .
" <i>hybridum</i> var.	<i>Phoridium tenax</i> .
<i>Doronicum plantagineum</i> , var. <i>excelsum</i> .	<i>Phyllis capensis</i> .
<i>Echinacea purpurea</i> .	<i>Rudbeckia laciniata</i> .
<i>Echinops Ritro</i> .	" <i>nitida</i> .
<i>Eryngium amethystinum</i> .	<i>Salvia virgata</i> .
<i>Ferula tingitana</i> .	<i>Senecio macrophyllus</i> .
<i>Helenium autumnale</i> .	<i>Sidalcea malviflora</i> .
" var. <i>striatum</i> .	<i>Silphium laciniatum</i> .
<i>Helianthus argophyllus</i> .	<i>Spiraea Aruncus</i> .
" <i>cucumerifolius</i> .	<i>Thalictrum aquilegifolium</i> .
" H. G. Moon.	<i>Veratrum nigrum</i> .
	<i>Verbascum olympicum</i> .

II.—A selection of fifty perennials, 1 to 3 feet high, for the herbaceous border.

<i>Aconitum orientale</i> .	<i>Heuchera sanguinea</i> .
<i>Anemone hortensis</i> , var. <i>fulgens</i> .	<i>Incarvillea Delavayi</i> .
<i>Anthemis tinctoria</i> , var.	<i>Jasione perennis</i> .
<i>Aquilegia chrysantha</i> .	<i>Liatris spicata</i> .
" <i>occidens</i> .	<i>Lobelia cardinalis</i> .
<i>Bupthalmum salicifolium</i> .	<i>Lupinus nootkatensis</i> .
<i>Centaurea purpurea</i> .	<i>Lychnis Haageana</i> .
<i>Delphinium nudicaule</i> .	" <i>vespertina</i> , fl. pl.
<i>Dicentra eximia</i> .	" <i>Viscaria splendens</i> , pl.
" <i>spectabilis</i> .	<i>Morina longifolia</i> .
<i>Dictamnus Fraxinella</i> .	<i>Othonnopsis cheirifolia</i> .
<i>Doronicum plantagineum</i> .	<i>Pæonia</i> , garden var.
<i>Epimedium pinnatum</i> .	<i>Pulmonaria arvensis</i> .
<i>Erodium Manescavi</i> .	<i>Rudbeckia speciosa</i> .
<i>Funkia ovata</i> .	<i>Scabiosa caucasica</i> .
" <i>Sieboldii</i> .	<i>Sedum spectabile</i> .
<i>Gaillardia aristata</i> .	<i>Senecio Doronicum</i> .
" <i>grandiflora</i> .	<i>Spiraea astilboidea</i> .
<i>Galega officinalis</i> .	" <i>palmata</i> .
<i>Gentiana asclepiadea</i> .	<i>Statice latifolia</i> .
" <i>lutea</i> .	" <i>limonium</i> .
<i>Geum chilense</i> .	" <i>sinensis</i> .
" <i>occidentale</i> pl.	<i>Thermopsis caroliniana</i> .
<i>Gillenia trifoliata</i> .	<i>Tiarella cordifolia</i> .
<i>Gypsophila paniculata</i> .	<i>Tritonia hybrida</i> .
<i>Helenium pumilum</i> .	<i>Trollius asiaticus</i> .
<i>Hemerocallis aurantiaca</i> .	" <i>europæus</i> .
" <i>flava</i> .	<i>Veronica longifolia</i> .
" <i>fulva</i> .	" <i>spicata</i> , var. <i>alba</i> .
<i>Hesperis matronalis</i> .	

III.—A selection of fifty perennials, less than 1 foot high, for the herbaceous border.

<i>Acena Buchananii</i> .	<i>Armeria alpina</i> .
" <i>microphylla</i> .	<i>Arnebia echinoides</i> .
<i>Adonis amurensis</i> .	<i>Aubrietia</i> var., e.g. <i>Leichtlinii</i> .
<i>Ajuga genevensis</i> .	var. <i>rosea</i> , W. Ingram, Dr. Miles.
<i>Alyssum saxatile</i> .	<i>Calamintha alpina</i> .
" var. <i>citrinum</i> .	<i>Callirhoe involucrata</i> .
<i>Anemone blanda</i> .	<i>Cardamine pratensis</i> , pl.
" <i>coronaria</i> .	<i>Cheiranthus Marshallii</i> .
" <i>fulgens</i> .	<i>Chrysogonum virginicum</i> .
" <i>palmata</i> .	<i>Coronilla cappadocica</i> .
" <i>Pulsatilla</i> .	" <i>iberica</i> .
" <i>Robinsoniana</i> .	<i>Crepis aurea</i> .
<i>Arabis alba</i> .	" <i>rubra</i> .
<i>Arenaria grandiflora</i> .	

<i>Dianthus Atkinsoni</i> .	<i>Iberis gibraltarica</i> .
" <i>barbatus</i> , var.	<i>Papaver nudicaule</i> .
" <i>chinensis</i> , var.	<i>Phlox amona</i> .
" <i>deltoides</i> .	" <i>reptans</i> .
" <i>plumarius</i> .	<i>Platycodon grandiflorum</i> .
" <i>superbus</i> .	" <i>Mariesii</i> .
<i>Epilobium obcordatum</i> .	<i>Polemonium reptans</i> .
" <i>luteum</i> .	<i>Polygonum affine</i> .
<i>Epimedium pinnatum</i> .	" <i>sphaerostachyum</i> .
<i>Erigeron Roylei</i> .	<i>Potentilla nitida</i> .
<i>Gentiana acaulis</i> .	<i>Saxifraga granulata</i> , fl. pl.
<i>Geranium sanguineum</i> and var.	<i>Silene Fortunei</i> .
<i>lancastrisense</i> .	" <i>Schafta</i> .
<i>Hacquetia Epipactis</i> .	<i>Veronica gentianoides</i> .
<i>Helleborus niger</i> , var.	

IV.—*A selection of spring-flowering bulbous- and tuberous-rooted plants for the herbaceous border.*

<i>Allium neapolitanum</i> .	<i>Galanthus nivalis</i> .
<i>Anthericum Liliago</i> .	<i>Hyacinthus amethystinus</i> .
" <i>Liliastrium</i> .	<i>Iris pumila</i> .
" <i>ramosum</i> .	" <i>reticulata</i> and var. <i>Krelagii</i> .
<i>Brodiaea uniflora</i> .	" <i>stylosa</i> and var.
<i>Bulbocodium vernum</i> .	" <i>verna</i> .
<i>Camassia esculenta</i> .	" <i>xiphoides</i> .
<i>Chionodoxa Alleni</i> .	" <i>Xiphium</i> .
" <i>Ludlowi</i> .	<i>Leucojum vernum</i> .
" <i>sardensis</i> .	<i>Merendera caucasica</i> .
<i>Colechicum</i> .	<i>Muscari</i> spp., e.g. <i>botryoides</i> ,
<i>Crocus</i> spp., e.g. <i>Imperati</i> ,	<i>grandiflorum</i> , &c.
<i>Malyi</i> , &c.	<i>Narcissus</i> —any, not omitting,
<i>Eranthis hyemalis</i> .	<i>Sir Watkin</i> , <i>Emperor</i> , <i>Em-</i>
<i>Erythronium Dens-Canis</i> .	<i>press</i> , <i>Barri conspicuus</i> , <i>po-</i>
<i>Fritillaria aurea</i> .	<i>ticus</i> , and <i>Leedsi</i> .
" <i>imperialis</i> .	<i>Ornithogalum nutans</i> .
" <i>Meleagris</i> and var.	<i>Scilla bifolia</i> .
" <i>alba</i> .	" <i>hispanica</i> .
" <i>pluriflora</i> .	" <i>sibirica</i> .
<i>Galanthus Alleni</i> .	<i>Seyrinchium grandiflorum</i> .
" <i>Elwesii</i> .	<i>Tulipa</i> sp. and var.
" <i>Fosteri</i> .	<i>Uvularia grandiflora</i> .

V.—*A selection of summer-flowering bulbous- and tuberous-rooted plants for the herbaceous border.*

<i>Allium narcissiflorum</i> .	<i>Kniphofia aloides</i> var.
<i>Alstroemeria</i> spp.	" <i>Nelsoni</i> .
<i>Antholyza paniculata</i> .	<i>Lilium auratum</i> .
<i>Asphodelus racemosus</i> .	" <i>Hansonii</i> .
<i>Calochortis</i> .	" <i>Henryi</i> .
<i>Eremurus Elwesianus</i> .	" <i>longifolium</i> var.
" <i>robustus</i> .	" <i>Martagon</i> .
<i>Galtonia candicans</i> .	" <i>pardalinum</i> .
<i>Gladolius gandavensis</i> var.	" <i>speciosum</i> var.
" <i>Lemoinei</i> .	" <i>testaceum</i> and others.
" <i>Nancianus</i> .	<i>Sternbergia lutea</i> .
<i>Iris germanica</i> .	<i>Tigridia Pavonia</i> .
" <i>sibirica</i> .	<i>Trillium grandiflorum</i> .

II.—THE ALPINE GARDEN.¹

The term "alpine plants" is used to include many which are not mountain plants at all; it is here applied to ornamental hardy plants of low stature, such as may be successfully grown among large stones, either facing a bank or elevated above the level of the ground.

There are some favoured gardens where natural rockeries exist, or where the conditions of the soil with regard to quality or drainage are such that choice and delicate mountain plants may be grown on the ground-level in ordinary borders. Such gardens exist in several

districts in England, and are common in Scotland and Wales; few rules are necessary there, where plants have only to be planted and kept clear of weeds in order to thrive.

But most of us who wish to grow choice alpine plants in our gardens have to make the best of conditions naturally unfavourable, and in doing this we can be helped by the experience of those who have made it their special study.

The first necessity for growing choice alpine plants is to secure perfect drainage for the soil in which they grow. Supposing that no part of a garden naturally gives the conditions in which alpine plants will thrive, we must make these conditions by artificial means. Those who wish to grow them on flat borders on retentive wet soils may do so on the ground-level by digging out the soil to a depth of 3 feet, and draining the bottom of the bed to the nearest outfall, and filling up to the surface with soil mixed with two-thirds of broken stone, either in small or large pieces. But in heavy soils, where large stones are easily obtained, still better beds for alpine plants may be made by enclosing the space with large blocks to a height of 2 or 3 feet, and filling up as before directed. The sides of these stone blocks can be covered with many ornamental plants in addition to those which are grown on the raised surface.

The commonest way of cultivating alpine plants is upon what are called rockeries, or loose rough stones laid together in different forms and methods. The forms in which a rockery can be constructed may be divided into three: (1) The barrow-shaped rockery, (2) the facing rockery, and (3) the sunk rockery. The first may be raised anywhere, the other two depend partly upon the configuration of the ground. No wood or tree-roots should be used to supplement any of them; they must be all stone. The kind of stone is seldom a matter of choice; everyone will use what is most handy. The rougher and more unshapely the blocks the better. The size should vary from 40 or 50 lbs. to 3 or 4 cwts. No mortar or cement for fixing them together must ever be employed; they must be firmly wedged and interlocked, and depend upon one another, and not upon the soil between them, to keep them in their places. This rule is of the utmost importance; if it is neglected, a long frost or an excessive rainfall may cause the whole structure to collapse.

Each successive part of the stone skeleton must be put together before the soil is added. This applies to all rockeries.

The most convenient size for the barrow-

¹ Reprinted, with slight alteration, from the *Journal of the Royal Horticultural Society*, with the permission of the author, the Rev. C. Wolley-Dod, M.A.

shaped rockery is about 4 feet high, and 6 or 7 feet through at the base. The length is immaterial. If the long sides face north-east and south-west it will afford perhaps the best variety of aspect; but the amount of sunshine each plant gets will depend on the arrangement of each stone as much as upon the main structure.

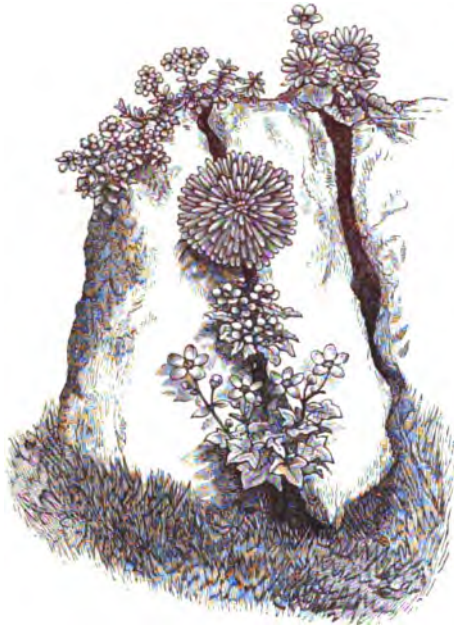


Fig. 417.—Method of planting *Fisures*.

There cannot be too many projections, and care must be taken to leave no channels between the stones by which the soil can be washed down to the base. Overhanging brows, beneath which plants can be inserted, are very useful; large surfaces of stone may here and there be left exposed, and irregularity of form is far better than symmetry. A formal arrangement of flat pockets or nests offends the eye without helping the cultivator, as the requirements of alpine plants as regards slope of surface and moisture at their roots are very various. The degree of slope from the base to the summit of the barrow should not be uniform. In some places there will be an irregular square yard of level on the top, bounded by large cross keystones, for which the largest stones should be reserved. In other parts the sides will slope evenly to the ridge; or the upper half may be perpendicular, leaving only wide crevices to suit the taste of certain plants. If the blocks are very irregular in form, and their points of contact as few as possible, providing only for secure interlocking, there will be plenty of room for soil to nourish

the plants. Ever-changing variety of stone surface, both above and below the soil, is the object to be aimed at, and any sort of symmetry must be avoided.

The facing rockery is dependent upon the natural shape of ground-surface. Wherever there is a steep bank facing south or east it may be utilized for the growth of alpine plants. The stones, as before advised, should be large and unshapely, and be buried to two-thirds of their bulk, and form a very uneven surface, all being interlocked from top to bottom as described. Rockeries of this form are less liable to suffer from drought; if the surface covered is large, access to all parts should be provided by convenient stepping-stones, because although every stone in the structure ought to be capable of bearing the weight of a heavy man without danger of displacement, it is better not to have to tread upon the plants.

The sunk rockery is perhaps the best of all, but entails rather more labour in construction. Where subsoil drainage is perfect, a sunk walk may be made, not less than 10 or 12 feet wide, with sloping sides. The sides may be faced with stones, as described in the facing rockery, and all or part of the excavated soil may be made into a raised mound, continuing the slopes of the excavated banks above the ground-level, and thus combining the facing rockery and the barrow rockery. If the outer line of this portion above the ground be varied by small bays, every possible aspect and slope may be provided to suit the taste of every plant. However, unless drainage is perfect, a sunk walk, rising to the ground-level at each end, would not be feasible. But a broad walk, excavated into the side of a hill and sloping all one way, could be adapted to a structure nearly similar to that described, or the ground may be dug out in the form of an amphitheatre to suit the taste or circumstances.

Whatever the form of rockery adopted, let the situation be away from the influence of trees, beyond suspicion of the reach of their roots below, or their drip, or even their shade, above. Trees which only shelter from high winds are so far serviceable, and so are walls and high banks. There are few alpine plants for which a storm-swept surface is good, but trees are objectionable where they lessen the light, which is an important element in the welfare of most mountain plants. The shade and shelter afforded by the stones and form of the structure itself is the best kind of shade and shelter.

We now come to the subject of soil, which

is very important. Where atmospheric and mechanical conditions are favourable, the chemical combination of the soil is of secondary consideration. So large a proportion of ornamental plants are contented with the soil which most cultivators provide for all alike—even though in nature they seem to have predilections—that where an amateur has only one rockery it would be too perplexing to study the partiality of every plant, and to remember every spot where lime-lovers or their opposites had been growing. I have some rockeries where both soil and rock are adapted exclusively for lime plants; others from which lime is kept away, and where both soil and rock are granitic; but the great majority of plants thrive equally well on both.

Whatever the character of the soil may be, we must take care that it does not retain stagnant moisture, and yet it must not dry up too readily. Plants must be able to penetrate it

and prevents their leaves being fouled. Use for this purpose the same riddled stone as described above, which is better than gravel, as round pebbles are easily washed off the slope by rain or in watering.

Having constructed our rockeries, we must furnish them with plants. It is better not to be in a hurry to see the stones covered. It would be easy to cover them with growth in a single season, but we must not degrade choice alpinists by putting them with Periwinkles, Woodruff, St. John's Wort, Dead Nettles, Creeping Jenny, fast-running Sedums, and Saxifrages, which do duty for alpinists on raised structures of roots or stones in the shady, neglected corners of many a garden. Some of these things are very pretty and desirable in their way, but such subjects must be carefully kept off the alpine rockery. As a rule, nothing should be planted which cannot be easily and entirely eradicated.

If different rockeries, or separate parts of the same, can be assigned to rapid growers and to dwarf compact plants it will be an advantage. There are many subjects which belong to the class of alpinists which require to be displayed in a broad and high mass to do them full justice. Aubrietias, for example, and *Veronica prostrata* should look like purple or blue cataracts; others should be unlimited in breadth, like the dwarf, mossy Phloxes and the brilliantly-coloured Helianthemums. They do not like being cropped round to limit their growth, and if there is not enough room for them they had better be omitted, as the small and delicate gems of the collection must run no danger of being smothered by overwhelming neighbours, and this requires both careful arrangement and constant watching. When first I began to cultivate alpinists I planted somewhat indiscriminately together things which I thought would make an ornamental combination, but the weaker soon became overwhelmed in the fight with the stronger, and there was nothing to be done but to build a new rockery and plant it more carefully. In this way I have now constructed at least a dozen rockeries, trying each time to benefit by past experiences and to exclude weedy plants. The first and second made still continue, and are still flowery wildernesses in spring, but everything choice and delicate upon them has either long ago perished or been transferred to new quarters. Visitors to my garden in spring who are not connoisseurs in alpinists think these wild rockeries far more ornamental than the half-bare stone-



Fig. 418.—Correct arrangement of stones to provide root accommodation for plants.

easily with their roots, the lengths of some of which must be seen to be believed. Good loam, with a little humus in the form of leaf-mould or peat, and half or three-quarters of the bulk composed of stone riddlings from the nearest stone quarry, and varying in size from that of rape-seed to that of horse-beans, make up a soil with which most alpinists are quite contented. The red alluvial clay of Cheshire, burnt hard in a kiln, and broken up or riddled to the above size, is an excellent material mixed with a little soil and a little hard stone. Where you are convinced that lime is useful, it may be added as pure lime, not planting in it till thoroughly slaked by mixture with the soil. All alpinists delight in a rough surface-dressing, as it keeps the top of the soil sweet and moist,

heaps where my choicest plants are grown, and which they think will look very nice in a year or two when they are as well covered as the others. I have mentioned this to show that those who can appreciate the beauty of the smaller and more delicate alpine, and grow them for their own sake, must be contented to see their favourites surrounded in many instances by bare stones; but the stones, especially if they contain cracks, may often be clothed with plants without any danger of overcrowding.

I have said little about choice of stone for rockeries, though I have tried many kinds, and of all I have tried I prefer the carboniferous limestone, common in North Wales, Derbyshire, and the North of Lancashire. The loose blocks of this which lie about the land are full of cracks, and are varied in shape. These crevices are the very place for some of the choicest alpine. *Paronychia* shows its true character in no other spot. *Potentilla nitida* flowers when fixed in them, and there only. They are excellent for *Phyteuma comosum*. The Spider-web Houseleeks delight in them, and so do some of the smaller Saxifrages. There are many alpine which do well only on condition of resting upon stone with their leaves and branches. It is so with *Pentstemon Scouleri*, and with that most charming dwarf shrub, *Genista pilosa*, which rises hardly an inch off the stone, though it may cover several square feet.

The best aspect for alpine is east, and west is the worst; but there is not a spot on any rockery which may not be filled with a suitable tenant. Some of the most ornamental flowers abhor, in the atmosphere of my garden, even a glimpse of the sun. *Ramondia pyrenaica* is withered up by it in an hour; so is *Cyananthus lobatus*; and these must be shaded on every side but north. As a general rule, I find all Himalayan alpine impatient of sunshine; they may endure it in their own home, where they live in an atmosphere always saturated with wet. However, it is only the deep recesses of the rockery towards the north which get no sun at all, and plenty of things are quite contented on the north side of the slope.

Bulbous plants generally, I find, do as well or better elsewhere. Their leaves are untidy just at the time when the rockery ought to be most gay and neat; and watering in summer, which other plants require, is bad for them, so I have not included them in my list.

Weeding, carefully done, is a necessity on rockeries, for weeds will come. Plants which

seed about freely are to be avoided. The Harebells and alpine Poppies, pretty as they are, must be excluded on this account; so must that weedy little plant *Saxifraga Cymbalaria*, which can be grown on any wall. The fewer weeds there are, the more likely are seedlings of choice and rare plants to assert themselves. For instance, *Geranium argenteum* grows in crevices into which the seeds are shot when ripe, and where plants could not be inserted, and keeps up the supply of this elegant alpine.

A few words may be in place here about raising alpine from seed; for constant succession is necessary, the duration of their life in cultivation being far shorter than in their native home. Reproduction from seed ensures the healthiest and finest growth. When ripe seed is gathered I recommend its being sown at once. It is then more likely to come up quickly; and as all such plants as we grow on rockeries are better sown in pans, there is seldom difficulty in keeping small seedlings through the winter.

Many alpine seem never to make seed in cultivation, and must be reproduced by division or cuttings. Some plants grow very slowly, though not long-lived, and a constant succession from cuttings must be ensured.

Where the area of rockery is considerable, a cold frame should be assigned for keeping up the supply of plants for it—cuttings and seedlings—in pots. The best treatment of these plants in winter has been much discussed. I think all attempts to imitate natural conditions, such as snow and long rest, by unnatural means are mistakes. During warm winters mountain plants will grow, and must be allowed to grow, and to keep them unnaturally dark or dry when growing is fatal to their health. Even in severe frosts air must be given abundantly in the day-time, and the frames must not be muffled up. Stagnant air, whether damp or dry, is their worst enemy; but if the weather is warm enough to set them growing, they may easily die for want of moisture. There are certain very early flowering alpine upon which a mixture of admiration and lamentation is bestowed at the end of every winter. Their flowers are often beautiful at the beginning of February, and are suddenly destroyed by a return of winter in its severest form. I may mention, amongst others, *Saxifraga Burseriana* and *sancta*, and their near relatives and hybrids, *Primula marginata* and *intermedia*, *Androsace carnea*, *Chamaejasme* and *Laggeri*, several dwarf species of *Alyssum* and *Iberis*, and there are a good

many more. Pots or pans containing these may be grouped together in an open sunny spot, and plunged in sand or coal-ashes, in a rough frame made for them, so that the lights may be not more than 3 or 4 inches above the pots. These lights should be removed in the daytime when the weather is fine, and air should be admitted, according to the temperature, at night. Such a sheet of elegant beauty, lasting, if well arranged, through February, March, and April, may be obtained in this way that I often wonder why amateurs attempt to flower early alpine in any other fashion. I recommend those masses of covered pots in early spring to all cultivators of alpine.

In the following list I have made a careful selection of 150 or so alpine plants suited for English rockeries, from which all coarse growers are excluded.

Rock Plants suitable for English Gardens.

<i>Acantholimon venustum.</i>	<i>Edraianthus dalmaticus.</i>
<i>Achillea argentea.</i>	<i>Epilobium obovatum.</i>
<i>Clavenna.</i>	<i>Erinus alpinus.</i>
<i>rupestris.</i>	<i>Erodium macrodonum.</i>
<i>tomentosa.</i>	<i>petreum.</i>
<i>umbellata.</i>	<i>Reichardi.</i>
<i>Æthionema grandiflorum, and</i>	<i>Erythraea diffusa.</i>
<i>others.</i>	<i>Fritillaria (dwarf kinds).</i>
<i>Alyssum pyrenaicum.</i>	<i>Geranium argenteum.</i>
<i>serpyllifolium.</i>	<i>cinereum.</i>
<i>Androsace carnea.</i>	<i>subcaulescens.</i>
<i>Chamaejasme.</i>	<i>Geum minutum.</i>
<i>lactea.</i>	<i>Globularia nana.</i>
<i>Laggeri.</i>	<i>Gypsophila cerasioides.</i>
<i>lanuginosa.</i>	<i>repens.</i>
<i>sarmentosa.</i>	<i>Haberlea rhodopensis.</i>
<i>villosa.</i>	<i>Hellianthemum.</i>
<i>Anemone alpina.</i>	<i>Hippocrepis comosa.</i>
<i>narcissiflora.</i>	<i>Houstonia.</i>
<i>sulphurea.</i>	<i>Hutchinsia alpina.</i>
<i>vernalis.</i>	<i>Hypericum Coris.</i>
<i>Anthemis Aizoon.</i>	<i>nummularium.</i>
<i>Aphyllanthes.</i>	<i>reptans.</i>
<i>Aquilegia pyrenaica.</i>	<i>Iberis petraea.</i>
<i>Arabis Androsace.</i>	<i>Frutl.</i>
<i>Halleri.</i>	<i>rupestris.</i>
<i>Arenaria balearica.</i>	<i>saxatilis.</i>
<i>grandiflora.</i>	<i>Tenoreana, &c.</i>
<i>laricifolia.</i>	<i>Leontopodium.</i>
<i>purpurascens.</i>	<i>Linaria alpina.</i>
<i>tetraquetra.</i>	<i>anticaria.</i>
<i>Arnebia echinoides.</i>	<i>hepaticifolia.</i>
<i>Aster alpinus.</i>	<i>Linum alpinum.</i>
<i>Athyllis montana.</i>	<i>Lithospermum fruticosum.</i>
<i>Aubrietia.</i>	<i>Gastoni.</i>
<i>Bellis caeruleascens.</i>	<i>petreum.</i>
<i>Calandrinia umbellata.</i>	<i>Lychnis alpina.</i>
<i>Campanula garganica.</i>	<i>Lagacea.</i>
<i>isophylla.</i>	<i>Micromeria piperella.</i>
<i>Portenschlagiana.</i>	<i>Myosotis rupicola.</i>
<i>Raineri.</i>	<i>Omphalodes Lucillae.</i>
<i>Waldsteiniana.</i>	<i>Onosma tauricum.</i>
<i>Cyananthus lobatus.</i>	<i>Oxytropis Halleri, &c.</i>
<i>Cyclamen.</i>	<i>Paronychia serpyllifolia.</i>
<i>Dianthus alpinus.</i>	<i>Phlox amena.</i>
<i>caesus.</i>	<i>setacea.</i>
<i>deltoides.</i>	<i>stellaria, &c.</i>
<i>neglectus.</i>	<i>Polygala Chamæbuxus.</i>
<i>sylvestris.</i>	<i>Potentilla nitida.</i>
<i>viscidus.</i>	<i>Pratia repens.</i>
<i>hybrida.</i>	<i>Primula Auricula.</i>
<i>Draba.</i>	<i>marginata.</i>
<i>Dryas octopetala.</i>	<i>viscosa, &c.</i>
<i>Drummondii.</i>	<i>Ramondia.</i>

<i>Ranunculus alpestris.</i>	<i>Sedum arboreum.</i>
<i>amplexicaulis.</i>	<i>Ewersii.</i>
<i>anemonoides.</i>	<i>populifolium.</i>
<i>hybridus.</i>	<i>pulehiellum, &c.</i>
<i>montanus.</i>	<i>Sempervivum (many sorts).</i>
<i>parnasifolius.</i>	<i>Spiraea crispiifolia.</i>
<i>pyrenæus.</i>	<i>umbellata.</i>
<i>rutæfolius.</i>	<i>Thymus Serpyllum (in many</i>
<i>Segueri.</i>	<i>varieties), &c.</i>
<i>Thora.</i>	<i>Tunica Saxifraga.</i>
<i>Rubus arcticus.</i>	<i>Veronica (several dwarf shrubs</i>
<i>Samolus repens.</i>	<i>from New Zealand).</i>
<i>Saponaria ocymoides.</i>	<i>aphylla.</i>
<i>Saxifraga.</i> These should be	<i>hybrida.</i>
bought by sight; varieties	<i>reptans.</i>
and hybrids are endless and	<i>saxatilis (in variety).</i>
good.	<i>apicata (true), &c.</i>
<i>Saxifraga arctioides.</i>	<i>Additional Shrubs.</i>
<i>Bursleriana.</i>	<i>Cytisus Ardoini.</i>
<i>cochlearia.</i>	<i>Daphne Blagayana.</i>
<i>Cotyledon.</i>	<i>Erica carnea.</i>
<i>diapensoides.</i>	<i>Genista pilosa.</i>
<i>longifolia.</i>	<i>Margyricarpus setosus.</i>
<i>marginata.</i>	
<i>oppositifolia.</i>	<i>Annuals.</i>
<i>retusa.</i>	<i>Grammanthes gentianoides.</i>
<i>sancta, &c.</i>	<i>Ionopodium acaule.</i>
<i>Scabiosa Parnassii.</i>	<i>Leptosiphon hybridus.</i>
<i>Sedum.</i> (See note under Saxi- fraga.)	

III.—THE WILD GARDEN.

The desire for less formality in the garden has led to the introduction of features which are more or less reproductions of nature's methods of planting and grouping, and one of the most recently-added features of this kind is what is termed the "Wild Garden". Probably the highest form of garden-art is that in which the hand of the artist is cunningly veiled, the effect being quite "natural". But considerable skill and knowledge are needed to produce this effect. Unfortunately, too, there are still many people who see no charm in gardening of this kind, the trim lawn, path, border, and bed being in their opinion the best form of garden. Wild gardening is, however, gaining in appreciation, and when it comes to be properly understood it will have a place in all gardens of any pretensions.

"The term 'wild garden' is applied to the placing of perfectly hardy plants in places where they will take care of themselves. It has nothing to do with the 'wilderness', though it may be carried out in it. . . . Some have thought of it as a garden allowed to run wild, or with annuals sown promiscuously, whereas it does not meddle with the flower-garden proper at all. The idea should be kept distinct from the various important phases of hardy plant growth in groups, beds, and borders in which good culture may produce many happy effects; from the rock garden, or borders reserved for choice hardy flowers; from growing hardy plants of fine form; from the ordinary

type of spring garden. In the smaller class of gardens there may be little room for the wild garden, but in the larger gardens where there is ample room on the outer fringes of the lawn, in grove, park, copse, or by woodland walks or drives, new and beautiful effects may be created by its means."—(W. Robinson.)

A meadow overrun with Cowslips, a plantation carpeted with the Wood or Apennine Anemones or with Bluebells, a shady bank with Primroses, a marsh aglow with Kingcups, a "waving sea of Daffodils" in copse or grove. These are pictures which in nature everyone can admire, and which have an equal charm in the garden. There are scores of exotics which are happy and most effective when treated in this same way.

The selection of plants must be according to circumstances as to position and conditions. Some knowledge of the nature of the soil to be planted is necessary, so that the plants chosen may be only such as are likely to become permanently established in it. A few experiments on a small scale might be made with a view to finding out what plants would thrive, before large quantities are put in. In planting, care to avoid a formal arrangement in regard to distance apart or outline of group is essential to a natural effect. An iron crowbar to make holes for the bulbs or tubers is as a rule the best planting-tool, one man to make the holes, and another to follow, dropping bulbs into them and filling them up with a handful of easily-manipulated soil. Such things as Daffodil, Crocus, Snowdrop, Fritillaria, Bluebell, Winter Aconite, Chionodoxa, Colchicum, Cyclamen, Tulip, and Snowflake are best planted in this way. Late autumn is the best time of year to plant all bulbs and tubers. Such plants as Primrose, Cowslip, Forget-me-not, Poppy, Foxglove, Oenothera, Golden Rod, Epilobium, and Viola are most conveniently raised from seeds sown in early spring. Care will be necessary for a month or two after germination to keep the seedlings from being smothered by rival plants.

Beautiful effects are obtainable by the planting of shrubs, both deciduous and evergreen, in this natural style. A bank covered with a tangle of Brier Rose or Honeysuckle; an irregular group of Mezereum Daphne on the outskirts of a plantation; a bold arrangement of Forsythia, Broom, Spiræa, Japanese Cydonia, Azalea, and such-like shrubs are easily-formed picturesque features worthy of any garden. From what has been said, it will be evident

to the gardener of taste that not only may the wild garden be made a thing of delight and interest, but that its methods afford the best of all ways for showing many plants to the greatest advantage.

Select Herbaceous and Alpine Plants.

Acæna.—A genus of shrubby trailers, with inconspicuous flowers, but succeeded by pretty spiny fruits. They are useful for covering rocks and ground beneath Pine-trees, as the pretty bronze or gray pinnate leaves are very ornamental. A mixture of sandy loam and peat suits them best, and propagation is effected by cuttings under a hand-glass, divisions, or seed.

A. microphylla (fig. 419). Reddish, trailer. New Zealand.



Fig. 419.—*Acæna microphylla*.

Acantholimon.—Dwarf tufted evergreens, with rigid and needle-shaped leaves. The flowers are arranged in a loose spike similar to those of Statice. They like plenty of sunshine, and any ordinary soil suits them. Propagated by cuttings, under glass.

A. glutaceum. Rose-pink, 3 inches. Asia Minor.

A. venustum. Rose, 4 inches. Asia Minor.

Acanthus.—Stately border plants, with large lacinate leaves and characteristic tall spikes of flowers. They are very effective, and besides being very useful for the border, make ornamental subjects for beds on lawns and woodlands. They require a deep soil and plenty of sun. Propagated by seed.

A. candelabrus. Purple and white, 1½ to 3 feet.

A. longifolius. Purple and white, 3 feet. South Europe.

A. mollis. White, 3 feet. South Europe.

Achillea.—A large genus, commonly known as Milfoila. The neat silvery-leaved species, such as *A. Clavenna* and *A. umbellata*, are pretty for the rockery, and *A. Millefolium*, var. *roseum*, and *A. Ptarmica*, "The Pearl", are excellent for the border, the latter being good for cutting, as the flowers are pure white and elegant. Increased by division in spring. Some of the species are apt to become weedy if not kept within bounds.

A. Clavenna. White, 6 inches. Europe.

A. Millefolium, var. *roseum*. Deep rose, 3 feet.

A. Ptarmica, vars. White, 2 feet.

A. rupestris. White, silvery foliage, 3 inches. Tyrol.

A. tomentosa. Bright yellow, 6 inches. Europe, Northern Asia.

A. umbellata. White, 4 inches. Greece.

Aconitum.—Ornamental, tall, free-flowering plants, with hooded irregular flowers in dense, erect racemes.

They delight in shade, and are most effective when planted in a border or shrubbery, growing freely in any



Fig. 420.—*Adonis pyrenaica*.

ordinary soil. Increased by division. The roots are intensely poisonous, and by inexperienced persons might easily be mistaken for Horse-Radish.

- A. Anthora*. Yellow. Europe, Northern Asia.
- A. Fischeri*. Bluish-purple, 4 to 6 feet. Northern Hemisphere.
- A. japonicum*. Flesh-coloured, 6 feet. Japan.
- A. Lycoctonum*. Yellow. Europe, North Asia.
- A. Napellus*, and vars. Blue, 3 to 4 feet. Northern Hemisphere.

Adonis.—Beautiful spring-flowering plants, suitable for the rock-garden or border. The flowers of most of the species are yellow, and sometimes measure $2\frac{1}{2}$ inches in diameter. Essentials to good growth are a good depth of soil, the roots to be left undisturbed. *A. amurensis* flowers early, and requires slight protection in March and April, or the blooms are likely to be injured by frosts. Increased by seeds or divisions.

- A. amurensis*. Yellow, 9 to 12 inches. Mandshuria.
- A. pyrenaica* (fig. 420).
- A. vernalis*. Yellow, 9 inches. Europe.

Æthionema.—Pretty little cruciferous plants, suitable for the rock garden, flowers white or pale-rose. They grow freely in sandy loam. *Æ. grandiflorum* is suitable for the border. Propagated by cuttings or seeds, and as in some gardens they are apt to succumb to damp conditions in winter, it is advisable to propagate every year.

- Æ. coridifolium*. Rosy-pink, 6 inches. Orient.
- Æ. grandiflorum*. Pink, 1 foot. Persia.
- Æ. persicum*. Pale pinkish-lilac, 4 inches. Persia.

Alstroemeria.—A large genus of summer-flowering, fleshy-rooted plants of easy cultivation. They should be planted 6 inches deep in a well-drained sunny position, and with a covering of litter or boards to give protection in winter they will be quite safe. The flowers, which are borne in terminal umbels, are useful for cutting; their colours range from yellow, orange, and red to deep-crimson and lilac, besides several spotted and marbled varieties.

- A. aurantiaca* (fig. 421). Deep-orange, 3 feet. Chili.
- A. chilensis*. Mixed colours, 2 feet.
- A. inodora*. Orange, spotted brown, 3 feet. Brazil.
- A. Light* (*pulchra*, *bicolor*, *Hookeri*, &c.). Variable in colour, 2 feet. Frequent in gardens under various names. Chili.
- A. Pelegrina*, var. *alba*. White, 1 foot. Chili.
- var. *rosea*. Pink, 1 foot.
- A. pulchella* (*psittacina*). Crimson green and brown, 3 feet. Brazil.
- A. varicolor* (*tigrina*). Yellow and purple, 1 foot. Chili.

Alyssum.—Pretty little plants of dense growth, very free-flowering and easily cultivated. They grow as well on the level border as on the rockery, but owing to their habit they are seen to best advantage in the latter position. They are used in the same way as Aubrietias. For covering the soil where bulbs are planted *A. saxatile* is most useful. They prefer a gritty soil. Propagated by seeds, cuttings, or division. *A. maritimum* (sweet Alyssum) is an annual.

- A. montanum*. White, 3 inches. Europe.
- A. podolicum*. White, 2 inches. Europe.
- A. pyrenaicum*. White, 3 inches. Pyrenees.
- A. saxatile*. Yellow, 6 inches. Europe.
- var. *citrinum*. Lemon-yellow.



Fig. 421.—*Alstroemeria aurantiaca*.

Amaryllis.—The Belladonna Lily is one of the most beautiful of autumn-flowering bulbous plants. It is hardy only in the south and west, but it may be grown with success in most parts of these islands if planted close to the south side of a warm wall. The leaves



Fig. 422.—Kew Belladonna.

require protection from early spring frosts. In some parts of Cornwall it has become almost a weed in gardens. There are various forms of it, the best of them being the Kew variety (fig. 422), which is an improvement on the type in respect of width of leaf, length of scape, and number of flowers in an umbel, as well as in their rich rose-red colour. Propagated by offsets, as in the Daffodil.

- A. belladonna*. White and rose, 18 inches. South Africa.
 „ *var. blanda*. Flowers pale-rose, wide petals.
 „ *var. pallida*. Flowers nearly white.
 „ *Kew var.* Rose-crimson, 2½ feet.

Androsace.—Charming little Alpine plants, related to Primula. They require an elevated position among stones in the rock garden, and a light loam or peat soil mixed with sand or grit. They dislike anything of the nature of sourness or stagnation, at the same time they require to be kept constantly moist. Propagated by means of cuttings or seeds. They flower in June.

- A. alpina*. Purplish-rose, 3 inches. Switzerland.
A. carnea. Pink, yellow eye, 4 inches. Switzerland.
A. Chamæjasme. White to pink, 3 inches. Austria, &c.
A. lanuginosa. Pink, yellow eye, 3 inches. Himalaya.
A. pyrenaica. White, yellow eye, 2 inches. Pyrenees.
A. sarmentosa. Rose, yellow eye, 3 inches. Himalaya.
 „ *var. foliosa*. Pink, 6 inches.

Anemone.—A large genus of herbaceous perennials, inhabiting cold and temperate regions. Some are distinctly Alpine, others frequent meadows and similar positions. They include a large number of beautiful garden plants, which, with few exceptions, are easily cultivated. They all like a moist situation, and a strong, generally loamy soil. Some of them, such as *A. apennina* and the native *A. nemorosa*, are happiest and most effective when planted in large numbers in the wild garden. The small growers are suitable for the rockery. *A. japonica* is one of the best of border plants. Propagated from offsets and seeds.

- A. alpina*. White, tinted blue, 2 feet. Europe.
A. apennina. Light-blue, 9 inches. Europe (Britain).
A. blanda. Blue, 9 inches. Asia Minor.
A. Halleri. Deep-purple, 6 inches. Europe.
A. Hepatica and *vars.* Blue, rose, and white, 6 inches. Northern Hemisphere.
A. narcissiflora. Cream, 1 foot. Northern Hemisphere.

A. nemorosa and *vars.* Mostly white, 8 inches. Northern Hemisphere.

- „ *var. Robinsoniana*. Azure-blue, 9 inches.
A. ranunculoides. Yellow, 9 inches. Europe (Britain).
A. risularia. White, 2 feet. Himalaya.
A. sulphurea. Lemon-yellow, 18 inches. Europe.
A. sylvestris. White, 18 inches. Europe.

Anthemis.—A small genus of showy border plants. The garden varieties of *A. tinctoria* are all desirable for garden purposes. They are very useful for the mixed border and rock garden. Increased readily by seeds.

- A. tinctoria*. Chiefly yellow, 18 inches. Europe (Britain).

Anthericum.—Useful early summer-flowering bulbous plants, including the St. Bruno's and St. Bernard's Lilies. The flowers are useful for cutting, and as the plants prefer half-shade, they are excellent for naturalizing in shady spots in the wild garden. Propagated by division or from seeds.

- A. Liliago* (St. Bernard's Lily). White, 2 feet. Europe.
A. Liliastrium (St. Bruno's Lily). White, 2 feet. Europe.
 „ *var. major*. Flowers larger. Height 3 feet.
A. ramosum. White, 2 feet. South Europe.

Aquilegia.—A genus of elegant plants. The flowers have a regular spurred corolla, which gives the plants a distinct and light appearance. They prefer a light, rich soil, and are admirably suited for border culture. Some of the dwarf kinds also find a home in the rock garden. Seeds are easily obtained, and this is the best way of propagating them, although they are extremely difficult to get true from seeds, as they so readily hybridize.



Fig. 423.—*Aquilegia cœrulea*.

- A. californica*. Red and yellow, 2 to 3 feet. California.
A. chrysantha. Golden-yellow, 2 feet. New Mexico.
A. cœrulea (fig. 423). Pale-blue and white, 2 feet. North-west America.
A. glandulosa. Deep-blue and white, 1 foot. Siberia.
A. Skinneri. Scarlet and yellow, 18 inches. Mexico.
A. vulgaris, *vars.* Mixed colours, 1½ to 2 feet. Northern Hemisphere.

Arabis.—A genus useful for its hardiness and early-flowering qualities. Besides the old garden favourite, *A. albida*, invaluable for edging borders and beds, there are three other good species worth growing in the rockery, viz.:—

- A. alpina*. White, 6 inches. Europe, North America.
- A. lucida variegata*.
- A. procurrens*. White, 6 inches. Transylvania.

Arenaria.—Low, evergreen Alpines, suitable for growing among stones. *A. balearica* is one of the gems of the rock garden. It spreads over the surface of the damp rocks with great rapidity, covering them with a carpet of green, which becomes starred in early summer with small white flowers. They like a sandy soil, and are easily propagated by seeds, divisions, or cuttings.

- A. balearica*. White, dwarf. Balearic Isles.
- A. grandiflora*. White, traller. Europe.
- A. lariofolia*. White, 3 inches. Europe.
- A. purpurascens*. Purple, 1 inch. Pyrenees.
- A. Rosant*. White, 3 inches. South Europe.
- A. tetraquetra*. White, 3 inches. Pyrenees.

Armeria.—The Sea Pinks are useful to form margins to borders; they also produce a very pretty effect when planted in tufts among stones. The flowers are usually shades of pink with scarious corollas. The method of propagation is by cuttings or seeds. All that is needed is to take an old plant, divide it up, and make the cuttings of single shoots. These will readily root; any failures should be made good at once. Cuttings of *A. latifolia* strike easily though not quickly.

- A. caespitosa*. Pink, 2 inches. Spain and Portugal.
- A. juncea*. Pink, 4 inches. South France.
- A. latifolia*. Bright-pink, 12 inches. Portugal.
- A. vulgaris* and vars. Pink, 9 inches. Europe, &c. (Britain).

Arum.—There are several hardy species which deserve a place in the garden. They have a tuberous root-stock, arrow-shaped leaves, and large-spathed flowers, which are generally followed by spikes of bright-red berries. They prefer a shaded and rather moist position. The big-spathed *A. crinitum*, often called *Dracunculus crinitus*, is one of the most striking members of the family; its hairy mottled spathe suggesting the large ear of some animal. It has pedately-divided leaves. *A. Dracunculus* has tall prettily mottled stems, compound leaves, and a large erect black purple spathe. The other species worth growing are:—

- A. italicum*. Yellow-green, 1 foot. Europe, &c. (Britain).
- A. maculatum*. Yellow-green, 9 inches. Europe (Britain).
- A. sanctum*. Black-purple, 1 foot. Orient.

Asperula.—Pretty little plants for the rockery and border. The common native Woodruff, *A. odorata*, is a useful garden plant with white flowers, having a hay-like odour, appearing in May. Propagation by division or seed. A light soil suits them best.

- A. odorata*. White, 4 inches. Europe, &c. (Britain).
- A. rubra*. Pink, 2 inches. Greece.

Asphodeline.—Summer-flowering bulbous plants, with grass-like foliage, growing well in ordinary garden soil, and well suited for border, shrubbery, or wild garden. They produce stately spikes of flowers in June and July, and are increased by means of seeds.

- A. lutea*. Yellow, 4 feet. South Europe.
- A. taurica*. White, 3 feet. Orient.

Aster.—Besides the Michaelmas Daisies and other popular forms of this large genus, there are the small Alpine species, which deserve to be grown in the rockery or select border. Easily raised from seed; also increased by division. For particulars of other species see special

article; also under *Callistephus* for what are popularly known as China Asters.

- A. alpinus*. Purple, 3 inches. Europe, North Asia.
- " var. *albus*. White, 3 inches.
- " var. *ruber*. Reddish, 3 inches.
- A. Stracheyi*. Purplish-mauve, 4 inches. Himalaya.

Astilbe.—Handsome plants with elegant feather-like plumes of flowers, popularly known as Spiræas, and often confused with Hoteias, of which *H. japonica* is the *Spiræa japonica* of gardens. They are easily managed, and are specially serviceable for marshy positions or by the side of ponds, streams, &c. Several hybrids have been raised by M. Lemoine between *A. Thunbergii* and *Spiræa astilboidea*. They are called Astilbe, "gerbe d'argent", &c. Increased by division.

- A. chinensis*. Pink, 3 feet. China and Japan.
- A. rivularis*. White, 3 feet. Himalaya.
- A. Thunbergii*. Bluish-white, 2 feet. Japan.

Astrantia.—A distinct little genus of umbelliferous plants, quaint, on account of the curious and pretty flower-heads. Propagation is effected by seeds. A damp position suits them best.

- A. carniolica*. White, 1 foot. Eastern Europe.
- A. major*. Pinkish, 2 feet. Europe (Britain).

Aubrietia.—Valuable plants for spring effects, when large masses of the various shades of violet, mauve, and purple add much beauty to border or rockery. They do best on a warm, light soil, but are not fastidious. All the garden forms are varieties of *A. deltoidea*. They are increased by division, cuttings, or seed.

- A. deltoidea*. Purple, 3 inches. South Europe.
- " var. *grandiflora*.
- " var. *Leichtlini*. Bright-rose.
- " var. *purpurea violacea*.
- " var. *W. Ingram*. Deep, rich red.



Fig. 424.—*Bocconia cordata*.

Bocconia (Plume Poppies).—Noble plants, the stems growing to a height of 10 feet, the foliage light gray-

green and rather deeply divided, and the small creamy-white flowers, arranged in terminal panicles, of very graceful appearance. Planted in a bold mass in a bed on the lawn or in the border, they are most effective. They can be increased by seeds or division.

B. cordata (fig. 424). Creamy-white, 6 to 8 feet. China and Japan.

B. microcarpa. Creamy-white, 8 to 10 feet. China and Japan.

Boltonia.—Aster-like plants, flowering in August and September, and suitable for borders and shrubberies.

B. asterioides. Flesh-coloured, 5 feet. North America.

„ *var. decurrens*. Pink, 5 feet.

Brevoortia.—A monotypic genus of Liliaceæ, and native of California. *B. Ida-Maia* (*Brodiaea coccinea*) is a very beautiful plant, with drooping umbels of deep-red and bright-green tubular flowers. The bulbs should be planted in autumn, and left undisturbed. Propagated by seeds; the seedlings resulting will flower in three or four years.

Brodiaea.—Mostly North American plants of the order Liliaceæ, having usually beautiful and fragrant flowers. They are of easy cultivation, bulbs planted in autumn in well-drained soil requiring no protection, and as a rule increasing rapidly. *B. uniflora* (*Triteleia* or *Milla uniflora*) is one of the best species, growing very freely, and flowering profusely. It is an effective and pretty plant for the wild garden, planted in the grass, and is also used with good effect in pots for the cool house.

B. congesta. Deep-violet. North-west America.

B. grandiflora. Bright violet-blue. North-west America.

B. laza. Purplish-blue, 1 to 2 feet. California.

B. uniflora. White, faint violet lines, 1 foot. Buenos Ayres.

Buphthalmum.—Composites, very free-flowering, and useful for beds or borders, the leaves being large and hairy, and thickly clothing the stems so as to form dense masses of striking appearance, especially when surmounted by elegant heads of large showy yellow flowers with dark centres. Increased by division or seeds.

B. salicifolium. Golden-yellow, 3 feet. South Europe.

B. speciosum. Orange, 3 feet. Europe.

Calamintha.—Sage-like plants, suitable for the rockery, growing well in sandy soils. The flowers are rose-coloured, and they and the foliage are both fragrant. They flower in summer.

C. alpina. Rosy-purple, 4 inches. Europe.

C. glabella. Lilac-purple, 3 inches. North America.

C. grandiflora. Rosy-pink, 1 foot. Europe.

Oalandrinia.—A large genus of Purslanes, of which several are in cultivation. The best of them are those named below. They grow well in light loam in a sunny position, either in the rock garden or border, but they require protection in winter in the colder parts of the country. Propagated from seeds or division.

C. discolor. Rose-red, 1 foot. Chili.

C. oppositifolia. White, 1 foot. California.

C. umbellata. Red-purple, 1 foot. Chili.

Oallirhoe (Poppy Mallow).—Trailing plants, belonging to Malvacæ; flowers freely produced, violet and purple. Propagated by seeds. A warm position and a rich, free soil suit them.

C. alceoides. Lilac-purple, 2 feet. North America.

C. involucrata. Violet-crimson, traller. North America.

C. lineariloba. Striped lilac. North America.

Caltha (Marsh-Marigold).—Effective plants for the bog and margins of streams. The flowers come in spring, and seen in masses are particularly striking.

C. leptosepala. White, 1 foot. California.

C. palustris. Yellow, 1 foot. Northern Hemisphere.

„ *var. biflora*. White.

Oalystegia.—Climbing plants, nearly related to Convolvulus. They are effective trained on stretched wire or string against a wall, or to climb over twiggy stakes. Propagation by underground runners, which increase very rapidly, or by seeds.

C. hederacea, *f. pl.* Pink. Climbing. China, &c.

C. sylvatica. White. Climbing. South Europe, &c.

„ *var. rosea*. Pink.

Oamassia.—Plants of the Lily order, suitable for the herbaceous border, rockery, or woodland. The flowers are produced on tall, stout, handsome spikes, either white, cream, or blue. They are useful plants for brightening up odd shady corners, which are to be found in most gardens, large or small. They flower in May and June. Propagation may be effected by seeds and offsets.

C. Cusickii. Pale-blue, 3 feet. Oregon.

C. esculenta. Blue, 18 inches. North America.

C. Fraseri. Pale-blue, 1 foot. North America.

C. Leichlinii. White, 2 feet. British Columbia.

Campanula.—An extensive genus of plants of varied habit. Some of the taller kinds are excellent border plants, while the smaller-growing and trailing species are most suitable in the rock garden. They are all summer-flowering, and as a rule produce seed freely. Propagation by means of seeds, divisions, or cuttings. Ordinary



Fig. 435.—*Campanula trachelium*.

garden soil suits the majority of them, a few rare Alpine species being exceptions.

C. abietina. Purple, 4 inches. East Europe.

C. cæspitosa. Blue, 3 inches. Europe.

C. carpatica (fig. 425). Light blue, 1 foot. East Europe.

„ *var. trachelium alba* and *pelviformis*.

C. fragilis. Blue, 4 inches. Italy.

C. garganica and *vars.* Blue and white, 6 inches. Italy.

C. Hendersoni. Mauve, 1 to 1½ foot. Garden origin.

C. isophylla and *var. alba*. Blue and white, traller. Italy.

C. lactiflora. Light-blue, 3 to 4 feet. Caucasus.

C. latifolia and *vars.* Blue and white, 3 feet. Europe (Britain).

C. mirabilis (fig. 426). Light-blue, 1 foot. Caucasus.

C. persicifolia and *vars.* Blue or white, 2 feet. Europe (Britain).

C. portenschlagiana. Blue, 4 inches. Dalmatia.

C. pulla. Dark-purple, 4 inches. Europe.

C. pusilla and *alba*. Light-blue and white, 6 inches. Europe.

Cardamine (Lady's Smock).—Pretty plants of the order Cruciferae, preferring damp situations. The flowers of *C. pratensis*, fl. pl. are purplish when they first open, but become white. *C. trifolia* is an evergreen rock plant with small white flowers.

C. pratensis, fl. pl. White (purplish at first), 12 inches. Europe (Britain).

C. trifolia. White, 6 inches. Europe.

Carex (Sedge).—A large genus, but not many of the species are worth a place in the garden. *C. pendula* and *C. paludosa*, both natives, are perhaps the most useful.



Fig. 426.—*Campanula mirabilis*.

They are happiest when planted in wet positions, and are most serviceable for water-side gardens. Increased by seeds or division.

Centaurea.—Showy plants of easy culture, suitable for the back row of herbaceous border, or for open spaces in the shrubbery. The leaves are large, and in some of the species they are silvery, and therefore of striking appearance. Many are useful for decoration, and are largely grown by our market-growers for that purpose. Increased by division or seeds.

C. dealbata. Rose, 1½ foot. Asia Minor.

C. glastifolia. Golden-yellow, 4 feet. Asia Minor.

C. macrocephala. Yellow, 4 to 5 feet. Armenia.

C. montana. Blue, 1 to 2 feet. Europe (Britain).

C. ruthenica. Pale-yellow, 3 to 4 feet. Orient.

Centranthus (Red Valerian).—In some places in Britain—Kent, for instance—this handsome plant almost covers the railway banks, and is very striking when in flower in June. For clothing old walls, ruins, or for massing in the wild garden, it is a most serviceable plant. It is happiest and richest in colour when on chalk soils. There is a white variety, which is quite worth growing.

Cephalaria.—Somewhat coarse members of the Teazel family, more suitable perhaps for the wild garden and shrubbery than for the border. They are effective, and the flowers are useful for cutting. Increased by seeds.

C. alpina. Pale-yellow, 5 feet. Europe.

Cerastium.—Pretty silvery-leaved low-growing rock plants. Some of the hairy-leaved species are liable to

suffer from damp if not protected by a sheet of glass held by wire supports. Increased by division and seeds. *C. tomentosum*, which is the one best known in general cultivation, is increased by cuttings.

C. alpinum. White, 2 inches. Europe (Britain).

C. purpurascens. Purple, 2 inches. Asia Minor.

C. tomentosum. White, silvery foliage, 3 inches. Europe.

Ocheiranthus.—The Wallflower genus contains several pretty and fragrant Alpine species, which grow well in light soil in the border or rockery. Seeds sown in July, pricked out in a rather dry position, will flower the following spring. *C. Marshallii*, a hybrid, can only be propagated by cuttings. *C. Cheiri* is the progenitor of the popular forms of Wallflower, and is a true perennial when grown in a light stony soil in a sunny position.

C. alpinus. Pale-yellow, 1 foot. Europe.

C. Cheiri. Variable, 1 foot. Europe (Britain).

C. kewensis. Purple and brown (*Cheiri* × *mutabilis*).

C. Marshallii. Orange, 1 foot. Garden origin.

C. mutabilis. Bronze-purple, 2 feet. Madeira.

Chelone.—Closely allied to Pentstemon, and comprising some handsome border plants which flower in late summer and autumn. They are of easy culture, thriving in ordinary garden soil and any position, and may be pro-

pagated by seeds, cuttings, or division. Some of the plants known in gardens as Chelones are correctly Pentstemons, i.e. *C. barbata*, *C. gentianoides*, &c.

C. glabra. Creamy-white, 3 feet. North America.

C. Lyoni (major). Rosy-pink, 2 feet. North America.

C. obliqua. Violet-purple, 3 feet. North America.

Chionodoxa (Glory of the Snow).—A small genus of bulbous plants, related to Scilla. There is a hybrid between the two genera, namely *Chionoscilla Alleni* (*C. Lucilia* × *S. bifolia*). They are natives of Asia Minor and Crete, where they occur at high elevations, flowering among the melting snows. They are quite hardy in England, and are among the earliest of harbingers of spring. They should be planted on slopes, or even in grass, where the soil is suitable. They prefer a light, loamy soil in a position where they will not get baked in summer. The bulbs should be planted in autumn, about 3 inches deep, the distance between being not more than 3 inches. They may also be grown in pots for the conservatory, five or seven bulbs in a 48-sized pot.

C. Lucilia. Bright-blue and white, 8 inches. Asia Minor.

var. *alba*. White.

C. nana. White tinged blue, 8 inches. Crete.

C. sardensis (fig 427). Genetian blue, white eye, 8 inches. Asia Minor.

var. *gigantea*, a large-flowered form.

Chrysanthemum.—A genus of many species, of which only few are of value in the garden. There are, however, of these many varieties, particularly of the

Chinese species (*C. indicum*), the early kinds of which now fill an important place in the decoration of the herbaceous border during late summer and early autumn (see special article). Of the others, *C. maximum* is undoubtedly the best. It grows from 1 to 2 feet high, the stems clothed with dark-green foliage, and bearing large



Fig. 437.—*Chionodoxa sardensis*.

white flowers, which are most effective in the border, as well as being useful in a cut state. Propagation is easily effected by division or seed.

- C. carneum*. Rose, 1½ foot. Caucasus.
C. latifolium. White, 3 feet. A form of the following.
C. Leucanthemum. White, double, 2 feet. Europe (Britain).
C. maximum. White, 2 feet. Pyrenees.
C. nipponicum. White, 1½ foot. Japan.

Cimicifuga.—Tall, stately plants of easy culture, growing luxuriantly in a rich soil, their feathery plumes of creamy-white flowers being most effective in the border or in a moist sunny position in the wild garden. Propagated by division or seed.

- C. americana*. Creamy-white, 2½ feet. North America.
C. racemosa (fig. 428). White, 4 feet. North America.
C. simplex. White, 3 feet. Japan.

Clematis.—The hardy herbaceous species of this genus are well suited for flower borders. They can be planted at any time, and ordinary garden soil suits them. Propagation is effected by means of seeds. The large-flowered garden forms may be employed in a variety of ways in the border, or even in beds (see special article).



Fig. 428.—*Cimicifuga racemosa*.

- C. Davidiana*. Pale-blue, 2 to 3 feet. China.
C. integrifolia. Blue, white centre, 2 to 3 feet. South Europe.
C. recta. White, 2 to 3 feet. South Europe.

Onicis.—Summer-flowering composites of Thistle-like habit. Two species are fit for the border, or, better still, the wild garden. *C. heterophyllus* is an excellent sub-aquatic, *C. eriophorus* preferring a drier situation. Both purple, natives of Europe.

Colchicum (fig. 429).—Late-blooming bulbous plants, producing charming effects in the wild garden in late autumn, when their large Crocus-like flowers are developed, the foliage appearing in the spring. All the many varieties of *C. autumnale*, the native Meadow Saffron, are worth growing, their colours ranging from pure white to beautiful rosy-lilac; there are also striped forms. *C. Bivona* has large rosy-lilac flowers, and *C. Parkinsoni* has beautifully-chequered reflex segments.

- C. autumnale* and *vars.* White to pale-purple, 9 inches. Europe (Britain).
C. Bivona. Rosy-lilac, 6 inches. South Europe.
C. montanum. Purple, 8 inches. South Europe.
C. Parkinsoni. Lilac and purple, 6 inches. Asia Minor.
C. speciosum. Rose-purple, 1 foot. Caucasus.

Commelina (Spiderwort).—Allied to Tradescantia. The flowers, which are of the richest blue, are produced in summer and autumn. *C. caelestis* and its variety *alba* are fine border plants, attaining a height of about 2 feet. Propagated by offsets or seeds.

Convallaria (Lily of the Valley).—Graceful plants of dwarf habit, preferring a cool, shady place. The native species, *C. majalis* and its forms, are too well known to need description. They flower in May and June, and can be increased by division. The soil in which they are established should be enriched from time to time with leaf-mould or rotten manure. This plant is very largely forced by market-growers.

Convolvulus.—Twining plants of free growth, and mostly with handsome flowers. They are apt to prove troublesome in the borders on account of their spreading habit, and it is difficult to eradicate them. The common

Bindweed is one of the worst pests in a garden. *C. Cantabrica* and *C. mauritanicus* are trailing species delighting in a warm sunny corner, the one having pink and the other beautiful soft-blue flowers.

C. Cantabrica. Pluk, trailer. Europe.

C. mauritanicus. Blue, trailer. Northern Africa.

Coreopsis.—A handsome genus of composites, invaluable for the border. Some are annual, but the perennial species are amongst the best of hardy plants. The



Fig. 429.—*Colchicum autumnale*.

flowers have fringed petals, and vary in colour from shades of yellow and orange to a dark velvety-brown. Plants grow about 2½ to 3 feet high, the flowers being produced at the ends of slender branches. The flowers are very decorative in vases, &c. Propagation is effected by seeds.

C. grandiflora. Orange-yellow, 3 feet. South United States.

C. lanceolata. Yellow, 3 feet. North America.

C. verticillata. Bright-yellow, 2 feet. North America.

Coronilla.—A genus of the Pea family, with glaucous pinnate leaves, and flowers in compact heads. *C. varia* is a beautiful species, of climbing habit, with flowers of a lovely shade of heliotrope or lilac. These are produced in great profusion, and form sheets of bloom suitable for the shrubbery and rough parts of the rockery. *C. cappadocica* is a good yellow-flowered species of prostrate habit.

C. cappadocica. Bright-yellow, trailer. Asia Minor.

C. varia. Ro-y-lilac, 2½ to 3 feet. Europe (Britain).

Cortusa.—A small genus allied to Primula. The leaves are palmate, soft green, and hairy; and the flowers, which are reddish-purple, are produced in umbels. They delight in shady places or crevices in the rockery. Propagated by seeds.

C. Matthioli. Reddish, 6 inches. Europe, North Asia.

C. pubens. Pale-red, 4 inches. Transylvania.

Corydalis.—A small genus, allied to Fumitory. The flowers are pretty, mostly purplish-rose, and yellow, and the foliage is delicately-cut and fern-like. A mixture of peat and loam is the best to grow them in. The roots are very brittle, and require careful handling when dividing or transplanting. Seeds are slow in germinating.

C. bulbosa. Dull-purple and white, 6 inches. Europe (Britain).

C. capnoides. Sulphur-white, 1 foot. Europe.

C. lutea. Yellow, 6 inches. Europe (Britain).

C. nobilis. Golden-yellow, 1 foot. Siberia.

Crambe.—A small genus of Cruciferae. *C. cordifolia* is a handsome, large-leaved plant, producing tall branched racemes of white flowers, and is very suitable for the wild garden. *C. maritima*, the Sea-Kale, is also worth a place in the herbaceous border. A rich soil suits them. Propagated by dividing the roots, or by seeds.

C. cordifolia. White, 4 feet. Caucasus.

C. maritima. White, 4 feet. Europe (Britain).

C. orientalis. White, 4 feet. Orient.

Orinum.—Several species and one good hybrid of this essentially tropical genus are sufficiently hardy to be grown in sheltered positions in the open air in this country. They must have plenty of sunshine, protection from north and east winds, and a deep loamy soil in which they will obtain a good supply of moisture during summer. It is advisable to cover the bed in which they are planted with a 3-inch layer of coal-ashes or similar protective material if there is danger of severe frost. The bulbs should be planted with their bases 9 to 12 inches below the surface. Increased by offsets and seeds.

C. americanum. White, 2 feet. United States.

C. longifolium (capense). Pink, 2 feet. South Africa.

C. Moorei. Pink, 3 feet. South Africa.

C. Powellii album (fig. 430). White, 3 feet. Garden hybrid.

C. Powellii rubrum. Rose-red, 3 feet. Garden hybrid.

Cyclamen.—Pretty dwarf plants with roundish leathery leaves, sometimes beautifully marbled, produced annually from nut-like corms. They grow well in a mixture

of sandy loam and leaf-soil, and may be increased by seeds, which should be sown as soon as ripe. For the rockery, and for planting in rather sheltered places, especially under trees, they are admirable little plants. In some parts of the country there are large quantities of them naturalized in woods.

C. africanum. Deep-rose, 3 inches. North Africa.

C. coum, and vars. White to crimson, 3 to 4 inches. Greece and Asia Minor.

C. europæum. Crimson, fragrant. Europe, &c.

C. neapolitanum. Roey-pink. Europe.

Oynara (Cardoon).—Valuable as a vegetable, and sufficiently handsome to be used for the wild garden and



Fig. 430.—*Orinum Powellii album*.

rougher places. The leaves are large, silvery, and much divided, the flowers bluish-purple in heads. They like a good rich soil, and may be increased by seeds.

C. Cardunculus. Blue, 6 feet. Mediterranean region.

C. Scolymus. Purple. Europe.

Cypripedium.—The hardy species are mostly natives of North America. One, *C. Calceolus*, is a rare British plant. *C. spectabile* is the best of the genus, its large pink-and-white pouch-like flowers being very lovely, and freely produced. Their chief requirements are a moist situation and shade. If cultivated in pans a covering of moss should be given to prevent too much evaporation, and the soil should be of peat and loam, and kept moist always.

- C. acule.* Rose, 6 inches. North America.
C. Calceolus. Brown and yellow, 1 foot. Europe (Britain).
C. candidum. White, 6 inches. North America.
C. macranthon. Deep-purple, 9 inches. Siberia.
C. pubescens. Purple and yellow, 9 inches. North America.
C. spectabile. White and rose-pink, 1½ foot. North America.

Dahlia.—This important genus is dealt with specially elsewhere. The several species, if not so showy as their garden progeny, are bright and pretty, and deserve to be included in good collections. They require the same treatment as the garden varieties; they may be propagated from seeds.

- D. coccinea.* Scarlet, 4 feet. Mexico.
D. Merckii. Mauve, 3 feet. Mexico.
D. variabilis. Rose-purple, 4 feet. Mexico.

Delphinium.—The many beautiful species, varieties, and hybrids of this genus in cultivation are invaluable as



Fig. 431.—*Delphinium nudicaule*.

garden plants. Their colours range from white to all shades of blue and purple and red. They are easy of

cultivation in ordinary garden soil, although they well repay rich treatment. The improved garden forms are



Fig. 432.—*Dianthus neglectus*.

dealt with specially elsewhere. Propagation can be effected by root division, which should be done in spring or summer. Good varieties and hybrids should be increased in this way, or by cuttings and seeds.

- D. cardinale.* Bright-scarlet, 2 to 3 feet. California.
D. cashmirianum. Pale-blue, 18 inches. Himalaya.
D. grandiflorum. Deep rich blue, 1 to 1½ foot. Siberia.
D. nudicaule (fig. 431). Bright-red, 1½ foot. California.
D. Zalil. Sulphur-yellow, 4 feet. Afghanistan.

Dianthus.—A charming genus, which, besides contributing the Carnation, Pink, and Sweet William, with their numerous forms, contains some species of high garden value. They are essentially plants for sunny positions in the rock garden, provided there is moisture enough at the roots. Their flowers generally possess the charm of fragrance as well as beauty, and their foliage, of glaucous hue, and evergreen, is another good point. Several of the most beautiful, such as *D. glacialis*, are difficult to cultivate, and are therefore omitted here. Propagation by seeds, division, and cuttings.

- D. alpinus.* Deep-rose, 4 inches. Europe.
D. barbatus. Pink and red shades.
D. cæsius (Cheddar Pink). Rose, 6 inches. Europe (Britain).
D. callizonus. Rich rose, 2 inches. Transylvania.
D. chinensis. Rose, 3 feet. China.
D. neglectus (fig. 432). Rose, with darker spots, 3 inches. Europe.
D. petraeus. White, 6 inches. Eastern Europe.
D. plumarius. Pink, 6 inches. Europe (Britain).
D. superbus. Rose, 1 foot. Europe.

Dicentra.—Elegant plants with pretty fern-like foliage, and gracefully drooping racemes of heart or lyre-shaped flowers. The best known is *D. (Dicentra) spectabilis*, "Solomon's Tears", which has pink and white flowers, and besides being suitable for the border and

rockery, where it should be given rather a sheltered position, is also largely grown for forcing for the greenhouse. Propagated by division.

- D. eximia*. Reddish pink, 1 foot. America.
D. formosa. Carmine, 6 inches. North-west America.
D. spectabilis. Pink and white, 2 feet. Japan.

Dictamnus Fraxinella (Burning Bush) (fig. 433).—An interesting monotypic genus of several varieties, but the



Fig. 433.—*Dictamnus Fraxinella*.

type and the white variety are the most deserving. It forms a symmetrical bush 2 to 3 feet high, with Ash-like leaves, and erect terminal racemes of rather large purplish or white blossoms. A fragrant oil is secreted by the flower-stalks, and if a match be applied it flames like gunpowder. The whole plant has an aromatic scent. Increased by seeds, for the plant dislikes disturbance.

Digitalis.—A handsome genus, of which the native Foxglove, *D. purpurea*, is by far the most beautiful, especially in its improved garden forms, which are now numerous. *D. grandiflora* is the best of the perennial species. It has leafy stems 2 to 3 feet high, with numerous yellow flowers, and is easily grown in any garden soil. Increased by seeds.

Dodecatheon Meadia (Shooting Stars or American Cowslip).—A beautiful member of the Primrose family, now reduced to one species, although for garden purposes such forms as *integrifolium* (crimson), *ellipticum* (rose), and *Jeffreyanum* (purplish) deserve distinctive names. The flowers are borne in umbels on erect slender scapes a foot or so high, and are white, rose, lilac, or purple. Its chief requirement is a cool situation, the nature of the soil being of secondary importance, a sandy loam, or a mixture of leaf-mould and loam or peat, being equally suitable. Propagation by division in spring or from seeds, but the latter is a slow method.

Doronicum.—A genus of early-flowering Composites, natives of Europe and temperate Asia, about half a dozen of which are useful. The flowers are large, elegant, on tall scapes, and the plants are of vigorous growth. They are as valuable for rough places in the shrubbery or in the wild garden as for the herbaceous border, or even for beds on the lawn. Division or seeds.

- D. austriacum*. Yellow, 15 inches. Austria.
D. plantaginifolium. Yellow, 1½ foot. Europe (Britain).
 .. var. *excelsum*. Yellow, 3 feet.

Draba.—Neat little Alpines, their hairy leaves forming compact rosettes, and most of them having bright golden-yellow or white flowers. They like the sunniest positions in the rockery, and a soil in which plenty of grit or broken stone is mixed. Best propagated from seeds sown in July, young plants flowering most satisfactorily. Thus raised, the plants would flower in spring.

- D. aizoides*. Bright-yellow, 3 inches. Europe (Britain).
D. bruniifolia. Yellow, moss-like leaves, 2 inches. Caucasus.
D. dedeana. White, 3 inches. Europe.
D. Kotschyi. Yellow, 2 inches. Eastern Europe.
D. Mawii. White, 1 inch. Spain.

Dracocephalum.—Handsome border plants related to *Salvias*, with blue and purple flowers in spikes. They thrive in ordinary garden soil, and like dry, sunny situations. Propagation by seeds, or in the case of *D. Ruy-schianum*, cuttings in spring.

- D. grandiflorum*. Blue, 6 inches. Siberia.
D. Ruy-schianum. Purple-blue, 1½ foot. Europe.
D. speciosum. Pinkish-blue, 1½ foot. Himalaya.

Dryas (Mountain Avenas).—Rare evergreen Alpines, related to the Strawberry, of tufted habit, with small leathery ovate leaves, whitish beneath, and white flowers 1½ inch wide; the feather-like fruit are also attractive. They like a cool situation, and a chalk or limestone soil. *D. octopetala* is one of our most rare British Alpines.

- D. Drummondii*. Pale-yellow, 4 inches. North America.
D. octopetala. White, 4 inches. Europe (Britain).

Echinacea.—A small genus, closely allied to *Rudbeckia*, of which the North American *E. purpurea* (fig. 434) is a showy autumn-flowering perennial, having large purplish-mauve flowers with a small dark centre, borne on stout rigid stems 3 to 4 feet high. These are produced from short thick rhizomes. Increased by division in spring.



Fig. 434.—*Echinacea* (*Rudbeckia*) *purpurea*.

Increased by division in spring.

Echinops.—Robust Thistle-like plants with leafy stems 3 to 5 feet high, terminated by globular heads of hedgehog-like flowers of varied colours. In addition to their being good border plants, they are handsome when planted in bold

groups on the turf. Increased by seeds.

- E. bannaticus* (*ruthenicus*). Blue, 3 to 4 feet. Eastern Europe.
E. Ritro. Blue globular heads, 4 feet. Mediterranean region.
E. sphaerocephalus. White, silvery leaves, 4 feet. Europe.

Epilobium (Willow-herb).—Some of the species are excellent for naturalizing near water and in the wild garden, others are pretty dwarf plants suitable for the rockery. Some of them require to be kept within bounds, or they will spread rapidly by means of their underground stems, and become a nuisance. The cottony seeds are pretty when the pods burst, but they should be cut off before getting to this stage if near the borders, as the seedlings are troublesome. They are easily increased by division or seed.

- E. angustifolium*. Rose-magenta, 4 feet. Northern Hemisphere.
E. obcordatum. Rosy-purple, 4 inches. California.

Epimedium.—Valuable alike for their foliage and flowers, especially *E. rubrum*, the leaves of which stay on all winter, and become a beautiful bronzy-red colour. The leaflets are heart-shaped, on thin twiggy stems. They thrive in a compost of peat or leaf soil, and should have a sheltered corner. Propagated by division or seeds.

E. macranthum. Purple, 1 foot. Japan.
E. pinnatum. Sulphur-yellow, 1 foot. Persia.
E. rubrum. Red, 1 foot. Japan.

Eranthis (Winter Aconite).—Most valued of early spring flowers, appearing almost in the winter season. Their yellow flowers are most charming beneath deciduous shrubs or trees, or at the edges of the permanent shrubbery, and also in the rock garden. The difference between the two species is in the larger size of *E. cilicicus* and the brown tint of the involucre when young, and also in its being more deeply incised.

E. cilicicus. Yellow, brownish involucre, 3 inches. Asia Minor.
E. hyemalis. Yellow, 3 inches. Europe (Britain).

Eremurus.—Stately plants of the Lily order, hardy only in sheltered gardens. The roots are long and fleshy, their leaves in rosettes, Hyacinth-like, about 2 feet long, and the stout, erect, tall scapes bear spicate racemes of beautiful white, pale-mauve, pink, or yellow flowers, the inflorescence reaching a height of from 6 to 10 feet in some species. Their chief enemy is damp, especially during the winter and early spring, and if wet is allowed to lodge in the crowns it is liable to spoil the appearance of the spike for the whole season. In winter the driest and most sheltered position should be given them, and in early spring, as growth commences, they should be protected from frost by placing hand-lights over them, or some dry pine-needles. During summer they require a sunny position. A rich, deep, free soil is the best for them, and where the soil is rather poor an annual dressing of manure should be applied. They dislike root disturbance. Propagation by seeds sown as soon as ripe, the young seedlings being planted in frames until three years old, and then planted where they are to flower. The handsomest species are:

E. aurantiacus. Pale-yellow, 3 feet. Afghanistan.
E. Bungei. Bright-yellow, 1 to 3 feet. Persia.
E. elwesianus. Pale-flesh, 5 feet. Central Asia.
E. himalaicus. White, 3 to 5 feet. Himalaya and Turkestan.
E. Olgae. Lilac-white, 2 to 4 feet. Turkestan.
E. robustus. Pale-pink, 6 to 10 feet. Central Asia.
E. turkestanicus. Red-margined white, 4 feet. Turkestan.

Erigeron.—Easily-grown Aster-like plants, differing from that genus only in having the ray-florets in several series. Some of the low-growing species are suitable for the rockery, the tall-growing ones being better adapted for beds or borders. They are most effective when planted in a mass. A bed of *E. speciosus superbum* is a beautiful summer picture, lasting in flower throughout the latter end of summer and autumn. Propagated by division or seeds.

E. aurantiacus. Bright-orange, 9 inches. Turkestan.
E. compositus. Blue, 3 inches. North America.
E. glabellus. Lilac, 1½ foot. North America.
E. glaucus. Lavender-blue, 1 foot. North-west America.
E. Howellii. Lilac, 1 foot. North-west America.
E. philadelphicus. Rosy-pink, 1 foot. North America.
E. speciosus. Blue, 2½ feet. North-west America.

Erodium.—Pretty Geranium-like plants, most of them suitable for the rockery. The foliage is silvery in some species, and fern-like, making the plants attractive even without their flowers. A well-drained, warm position suits them, most of them being natives of Southern Europe. Their thick root-stocks are liable to

rot if there is too much moisture present. Propagation by seeds or cuttings taken in August.

E. chamaedryoides. White, evergreen, 2 inches. Balearic Isles.
E. macradenium. White, 6 inches. Pyrenees.
E. Manescavi. Purplish-red flowers. Pyrenees.
E. supracanum. Pinkish-white, 4 inches. Spain.
E. trichomanesfolium. White and purple, 6 inches. Syria.

Eryngium (Sea Holly).—Ornamental hardy herbaceous perennials, very effective in borders on account of their unique habit and colour. The steel-blue tint of the stems and spiny leaves of some of the species is very attractive, especially in late summer and autumn. *E. pandanifolium* is a noble plant for sunny positions in the warmer parts of the country. They delight in a light sandy soil and



Fig. 435.—*Eryngium pandanifolium*.

plenty of sunshine. The surest and best method of increasing them is by seeds, but division is sometimes practised.

E. alpinum. Lavender-blue, 2 to 3 feet. Europe.
E. amethystinum. Deep-blue, 2 to 3 feet. Europe.
E. Bourgati. Small, blue heads, 1 foot. Spain, &c.
E. giganteum. Glistening-white, 3 to 4 feet. Armenia.
E. Oliverianum. Amethyst-blue, 3 feet. Orient.
E. pandanifolium (fig. 435). Small, yellow, 5 to 9 feet. Brazil.

Erythraea.—Charming little plants, related to the Gentians. Ordinary soil suits them, with the addition of a little chalk, and a well-drained position in the rockery. *E. diffusa*, native of Western Europe, is a pretty perennial, with shining, fleshy leaves and deep rose-coloured flowers about 3 inches in height. Increased by seeds.

Erythronium (Dog's-tooth Violet).—So called from the shape of the bulb, which resembles a dog's tooth. They grow naturally in moist woods, and therefore the treatment which suits them best in gardens is a sandy peat or loam, in a shady moist position. The beautifully mottled leaves of some of the species alone should make them more grown than they are.

E. Dens-canis. Deep pink to white, 6 inches. Europe.
E. grandiflorum. Creamy-yellow, 9 inches. North-west America.
E. Hendersoni. Lilac, deep-purple eye, 9 inches. Oregon.
E. Howellii. Pale-purple, deep eye, 6 inches. Oregon.

Eucomis.—Striking plants for warm sunny positions, preferably at the foot of a heated wall, as for the Belladonna Lily. They have large bulbs, from which spring



Fig. 436.—*Fritillaria aurea*.

annually rosettes of large strap-shaped (generally mottled) leaves, and in late summer tall stout spikes of greenish flowers. Propagated by division.

- E. guttata*. Greenish-white and purple, 3 feet. South Africa.
E. punctata. Greenish-white and purple, 3 feet. South Africa.
E. regia. White, 1½ foot. South Africa.

Ferula (Fennel).—Noble plants of striking habit. Their large feathery leaves appear in early spring, and are most elegant. The branched flower-spike appears later, growing to a height of 10 feet or more, and although not strictly beautiful, is of telling appearance. They should be planted in good deep soil, in a sunny position. Easily raised from seeds.

- F. communis*. Yellow, 6 feet. Mediterranean region.
F. tingitana. Yellowish-white, 8 feet. North Africa, &c.

Francoa (Maiden's Wreath).—A rather tender plant, related to the Saxifragas. The pretty flowers are borne in spikes 18 inches to 2 feet in height. Warm sheltered positions on the rockery are best for them, and they prefer sandy loam.

- F. appendiculata*. Whitish, 2½ feet. Chili.
F. ramosa. Snowy-white, 2½ feet. Chili.

Fritillaria.—Liliaceous plants, many of which are more interesting botanically than useful for horticultural purposes. The well-known Crown Imperial, *F. imperialis*, is a tall plant, suitable for the mixed border, shrubbery, or wild garden. The bulbs should be planted 4 inches deep, and a top-dressing of manure after growth commences is very beneficial to established plants. The smaller kinds, such as *F. aurea*, *F. citrina*, and a few others, are useful for the rockery; they can also be grown in pots

for the cool house. They should be re-potted about every three years, and the offsets can then be removed and planted in boxes or pans. By this method flowering plants may be obtained much quicker than from seeds.

- F. aurea* (fig. 436). Yellow, 6 to 12 inches. Asia Minor.
F. citrina. Greenish-yellow, 15 inches. Asia Minor.
F. imperialis. Yellow and orange, 3 to 4 feet. Orient.
F. meleagris. White to purple, 1½ foot. Europe (Britain).
F. pudica. Small, yellow, 6 inches. North-west America.
F. recurva. Scarlet and yellow, ½ to 2 feet. California.
F. tulipifolia. Chocolate and gold, 9 inches. Kurdistan, &c.

Funkia (Plantain-Lily).—Beautiful flowering and foliage plants of the Lily order, useful for grouping or edging purposes, and also in the mixed border. The leaves are mostly cordate or broadly ovate, with well-marked veins. Flowers handsome, usually shades of lilac or white, produced in summer on elegant scapes. There are also variegated-leaved forms, which are distinct and useful. They require a rich, deep soil, and will do well in open situations. *F. grandiflora* is hardy only in the south and west. It prefers a light sandy soil and plenty of sunshine. Increased by division in early spring.

- F. grandiflora* (subcordata). 1½ foot. Japan.
F. lancifolia. Pale-blue to white, 1 foot. Japan.
F. ovata. Purple, 1½ foot. Japan.
F. Sieboldi. Lilac and white, 1½ foot. Japan.

Gaillardia.—Showy Composites, very useful for the border, where they are beautiful from June to October. There are many named garden sorts, raised chiefly from *G. aristata*, 2 feet in height, with flower-heads 2 inches in diameter of a brownish-orange colour. They thrive in ordinary soil. (See special article.)

Galanthus (Snowdrop).—Eight species of *Galanthus* are recognized, as well as many forms of only slight variations. *G. Olga-Reginae* often flowers in September, although, except for this quality, it may well be kept out of the garden; and there are several others which flower



Fig. 437.—*Galanthus cilicicus*.

late in the year. It is in early spring, however, that Snowdrops are most appreciated, especially where planted extensively. In grass, in the rockery, beneath deciduous

shrubs, among hardy ferns, and along margins of shrubberies and drives they thrive as a rule, and if left undisturbed, the bulbs usually increase. They may also be grown in pots, but they will not bear forcing. The best of them are *G. Alleni*, *G. cilicicus* (fig. 437), *G. Elwesii*, *G. Ikariz*, and the native species, *G. nivalis*.

Galega (Goat's Rue).—Good border plants, with white, blue, or lilac Pea-like flowers, which are valued for cutting. They like a sunny position and a rich loam to grow in. Increased by division or seeds.

G. officinalis, var. *alba*. White, 3 to 4 feet. Europe.

G. orientalis. Bluish-purple, 2 to 4 feet. Caucasus.

Galtonia candicans.—A South African Lily, and a handsome bulbous plant, which may be effectively used in the border or in beds among low-growing shrubs. The bulbs are about thrice the size of ordinary Hyacinth bulbs, and the erect stout flower-scapes are 3 to 4 feet high, clothed for a foot or more with elegant drooping white bell-shaped flowers over an inch long. In the colder parts of the country the bulbs should be lifted in late autumn, and kept in a dry cool shed until February, when they may be replanted.

Gentiana.—A genus of many species, most of which are unfortunately difficult to cultivate. Others, chiefly



Fig 438.—*Gentiana acaulis*

the taller-growing ones, are easily grown, and are excellent for the border or rockery. The dwarf kinds thrive best in rock-work, where they may be given special conditions both of soil and position. *G. verna* is one of the prettiest, but it rarely continues in good health for longer than two or three years. A moist, cool situation, with good drainage, are essential conditions in the cultivation of these plants. The soil should consist of loam, peat, and grit, with a top-dressing of stones to conserve the moisture in summer. The stronger-growing kinds may be propagated by division, but the others must be raised from seeds, although generally a slow method.

G. acaulis (fig. 438), (*Gentianella*). Blue, 3 inches. Europe (Britain).

G. asclepiadea. Blue, 1½ foot. Europe.

var. *alba*. White.

G. cruciata. Blue, 9 inches. Europe, &c.

G. lutea. Yellow, 3 feet. Europe.

G. pneumonanthe. Rich deep-blue, 9 inches. Europe (Britain).

G. septemfida. Blue, 9 to 12 inches. Caucasus.

G. verna. Brilliant-blue, 2 to 3 inches. Europe (Britain).

Geranium (Cranesbill).—Several beautiful rock and border plants belong to this genus. They prefer a well-drained soil, and do well on slopes or banks. *G. cinereum*

and *G. argenteum* have silvery leaves; they require glass protection in winter. The flowers are white, mauve, blue, and purple, sometimes prettily veined. Propagated by cuttings in August or by seeds, which must be gathered as soon as ripe.

G. argenteum. Pale-red, silvery foliage, 3 inches. Alps.

G. arvenum. Purplish-crimson, 2 feet. Orient.

G. cinereum. White, purple veins, 3 inches. Pyrenees.

G. ibericum. Purplish-blue, 2 feet. Caucasus.

G. macrorrhizon. Bright-purple, 1 foot. Eastern Europe.

G. sanguineum. Crimson-purple, 9 inches. Europe (Britain).

var. *lancustris*. Pink, 9 to 12 inches.

Gerbera Jamesoni.—In the warmer parts of the country this beautiful South African Composite is easily cultivated in a sunny border. From a tuberous root-stock it sends up annually pinnatifid leaves and erect scapes a foot high, bearing each a large Dandelion-like flower-head of the most brilliant scarlet colour. Under favourable conditions it ripens seeds freely.

Geum.—Pretty plants of the Rose order, with red or yellow flowers. The taller species, such as *G. chilense* and its varieties, have leaves unequally divided, and flowers of a beautiful bright-red colour. *G. montanum* and *G. reptans*, both yellow-flowered, are good low-growing rockery plants. They should be planted in stony soil, and given plenty of water during summer. Increased by division or seeds.

G. chilense. Bright-scarlet, 2 feet. Chili.

G. chilense. Various garden forms, viz. *grandiflorum*, *miniatum*, &c.

G. montanum. Golden-yellow, 1 foot. Europe.

G. rivale. Purple, 9 inches. North temperate regions.

Gillenia.—Delicate neat plants of the same character, and requiring the same treatment, as *Spiræa*. *G. trifoliata* has slender dark-red stems clothed with rose and white star-shaped flowers in July. Height 2 to 3 feet. It is a native of North America.

Gladiolus.—The several races of this fine genus are suitable for the herbaceous border. For particulars as to sorts and cultivation, see special chapter.

Gunnera.—Most of the members of this genus are water-side plants, with large Rhubarb-like leaves. These, in *G. manicata*, measure 9 feet or more in diameter. The inconspicuous flowers are borne on a thick club-shaped inflorescence, which should be cut out as soon as it appears, as the leaves develop better then. This and *G. chilensis* (*scabra*) are most usually seen in gardens. They like a deep, rich soil, a moist position, and shelter during the cold season. They enjoy the sun on their heads, and an ideal position for them would be a water-side hollow, with protecting banks of shrubs around. Copious manure waterings, or top-dressings of cow-manure, should be given. When the plants are dying down in autumn the crowns should be protected, and it is quite worth the trouble to arrange a covering of mats to protect them from spring frosts. Propagation by division or seeds.

Gypsophila.—A genus of Caryophyllaceæ, of which *G. paniculata* is the best-known species. It is an extremely useful plant, both for the border and for cut-flower purposes, being very effective in combination with the

large Marguerite Daisies, dark Clove-Carnations, or pink Roses. The flowers are borne on light graceful panicles. One or two dwarf species are pretty for the rockery. Propagation by seeds, division, or cuttings.

G. cerastioides. White, 3 inches. Himalaya.
G. paniculata. White, 2 to 3 feet. Siberia, &c.
G. repens. Rose-white, 4 inches. Europe.

Hacquetia.—The only species is *H. Epipactis*, a dwarf plant with close umbels of golden flowers surrounded by



Fig. 438.—*Helleborus niger*.

leaf-like bracts arranged in a star-like involucre, the whole not more than 1½ inch in diameter. It flowers from February to May, the leaves appearing later. It is suitable for the rock garden. Height, 2 inches.

Hedychium gardenianum (Garland Flower) is a striking plant both as regards foliage and flowers, and may be grown in a moist sunny border in the open air in the warmer parts of the country. It has Ginger-like rhizomes, stems 4 feet high bearing long sword-shaped leaves and large terminal heads of rich yellow flowers. Himalaya.

Helenium.—Strong-growing Composites suitable for the back row in the herbaceous border, or in shrubberies. The flowers are mostly yellow, and they are showy in autumn. Any soil suits them, and division is the best way of propagation.

H. autumnale. Yellow, 6 feet. North America.
 " var. *pumilum*. Golden-yellow, 2 feet.
H. Bolanderi. Yellow, with dark centre, 2½ feet. California.
H. Hoopesii. Orange-yellow, 2½ feet. North-west America.

Helianthus.—The perennial Sunflowers are among the most useful of autumn-flowering plants. Many attain a height of 8 feet or more, and they present a good deal of variety in habit, flowers, and leaves, although nearly all are yellow. By combining them with the perennial Asters many fine effects may be produced in autumn. They grow well in any soil, but prefer a rich, deep loam. Propagate by division and seeds.

H. decapetalus. Sulphur-yellow, 6 feet. North America.
H. doricoides. Small, yellow, 4 feet. North America.
H. giganteus. Bright-yellow, 7 feet. North America.
 " var. *H. G. Moon*. Rich golden-yellow, 4 to 5 feet.
H. multiflorus. Golden-yellow, 5 feet. North America.
 " Numerous garden forms.
H. oryzae. Golden-yellow, dark eye, 7 feet. North-west America.
H. rigidus. Rich yellow, habit good, 4 feet. North America.

Helleborus.—A genus of valuable plants on account of their long period of blooming, viz. from October till April. Ordinary soil suits them, but the position should be moist and slightly shaded. They dislike disturbance, and succeed well if planted in the wild garden or shrubbery.

The three species described below are the most easily procured. There are also many hybrids which are equally valuable for the open border. They are chiefly the result of crossing *H. colchicus*, a purple-flowered species, with forms of *H. niger*, *H. guttatus*, *H. abschasicus*, &c.

Propagation may be effected by root division if the plants are strong.

H. fatidus. Greenish, 1 foot. Europe (Britain).
H. niger (Christmas Rose) (fig. 439). White, 1 foot. Europe.
 " Numerous vars.
H. orientalis. Purplish-red, 1½ foot. Greece, Asia Minor.

Hemerocallis (Day-Lily).—Easily grown summer-flowering plants with large, fragrant, yellow- and orange-coloured flowers. They are vigorous growers, thriving in any garden soil; suitable for grouping, mixed border, shrubbery, or rockery. They are effective, too, by the water-side. Increased by division of the roots.

H. aurantiaca. Orange-red, 3 feet. Japan.
 " var. *major*. Larger flowers and broader leaves than the type.
H. Dumortierii (fig. 440). Bronzy-orange and yellow, 2½ to 3 feet. Japan, &c.
H. Dumortierii, var. *major*. Larger flowers.
H. flava. Clear-yellow, fragrant, 3 feet. South Europe.
H. fulva. Dark orange-coloured, 3 feet. South Europe.
H. Thunbergii. Pale-yellow, 2 feet. Japan.



Fig. 440.—*Hemerocallis Dumortierii*.

Heracleum (Cow-Paraley).—Large, bold-leaved, umbelliferous plants, with enormous heads of whitish flowers, on stout stems 8 feet or more long. Suitable for wild gardening or rough places. The best species is *H. villosum* (*giganteum*), a native of the Caucasus. Propagation by seeds.

Herniaria glabra.—Useful for carpet-bedding, as it forms dense tufts of leaves of a fresh-green colour all the year round. It spreads rapidly, and is most useful for covering bare spaces. On very cold soils it may fail in winter, but as a general rule it is hardy. Native of Europe and North Asia. There is a pretty golden-leaved variety. Increased by cuttings.

Hesperis matronalis fl. pl., the old Double Rocket, is a favourite border plant, especially in old-fashioned gardens. Its flowers are white with a tinge of pink, and are sweet-scented, especially in the evening. It thrives best in a strong soil, attaining a height of 1½ foot. The several forms of it include single and double, white and blue, or purple. They are frequently treated as annuals. After flowering the spikes should be cut down close and the sides shoots treated as cuttings, planting them out as soon as rooted.

Heuchera.—Pretty little plants related to Saxifrages, and well worth a place in the border or rockery. *H. sanguinea* is the best of them; it flowers in spring, the red bell-like flowers being gracefully arranged on slender scapes a foot or more long, and rising from the Geranium-like tuft of roundish, slightly hairy leaves. Propagation is effected by seeds.

- H. macrophylla*. Bronzy foliage, 2 feet. North America.
- H. micrantha*. Cream, 1 to 1½ foot. North-west America.
- H. Richardsoni*. White, veined purple, rich reddish-brown foliage. 2 to 4 feet. North America.
- H. sanguinea*. Coral-scarlet, 2 feet. New Mexico.
- " var. *grandiflora*.
- " var. *alba*.

Houstonia.—Pretty little plants for the rock garden. The leaves are tiny, in small tufts, and the flowers are



Fig. 441.—*Houstonia cœrulea*.

small, white, or of a pleasing blue colour. They grow best in sandy peat in a well-drained position in the rockery. It is best to keep a reserve stock in frames, as they do not winter well. This can be done by cuttings, division, or seeds.

- H. cœrulea* (fig. 441). Blue, 4 inches. North America.
- " var. *alba*. White.
- H. serpyllifolia*. Bluish, 4 inches. North America.

Humulus Lupulus.—The Hop is useful as a summer

creeper for covering verandahs, summer-houses, pergolas, &c There is a variegated form of it. The female is more ornamental than the male.

Hyacinthus.—Suitable for border, rockery, or naturalizing. *H. azureus* is one of the most charming of early spring flowers. It begins to flower quite early in January, and is good for 2 or 3 months. In habit it resembles the Grape Hyacinth, but the difference lies in the open perianth, Muscari having a constricted urceolate perianth. The colour of the flowers is a lovely azure-blue. *H. amethystinus* is a good plant for naturalizing, and should be more used for that purpose.

- H. amethystinus*. Amethyst, 1 foot. Pyrenees.
- H. azureus*. Azure-blue, 9 inches. Asia Minor.
- H. orientalis*. Dark-blue, 1 foot. Mediterranean region. The parent of the popular garden Hyacinth.

Hypericum (St. John's Wort).—Mostly shrubby plants, a few herbaceous, of which perhaps the best is the large-flowered *H. olympicum*. They like a well-drained sandy loam and a warm sunny position. Propagated by cuttings or seeds.

- H. Coris*. Yellow, 6 inches. South Europe.
- H. nummularium*. Yellow, 2 inches. Pyrenees.
- H. olympicum*. Large, yellow, 1 foot. Asia Minor.
- H. reptans*. Large flowers, dwarf. Himalaya.

Iberis (Candytuft).—A very useful genus either for the border or rockery, for spring and early summer flowering. They form cushion-like tufts of evergreen shoots, covered in spring with pure white flowers. Dry sandy soils and rock-work suit them well. *I. sempervirens* var. *Garreziiana* is an excellent plant for quickly covering unsightly portions of the rockery. *I. saxatilis* is a charming dwarf alpine. *I. gibraltaria* is a taller-growing species with large flowers slightly tinged with rose. Increased by seeds or cuttings.

- I. gibraltaria*. White, 1 foot. Spain. Morocco.
- I. saxatilis*. White, dwarf for rockery. South Europe.
- I. sempervirens*. Snowy white, 9 inches. South Europe.
- " var. *Garreziiana*. Large heads of white flowers.

Incarvillea.—A small genus related to Bignonia. Most of the species are of recent introduction. The best is *I. Delavayi*, a good plant for the border or rock garden, being perfectly hardy, the leaves perishing in winter whilst the fleshy root-stock survives. The leaves are pinnate and about 1 foot in length. The rose-red and yellow flowers, 2 to 12 in number, are borne on scapes from 1 to 2 feet in length. Easily increased by seeds, and if these are sown early the plants may be got to flower the first season.

- I. Delavayi* (fig. 442). Rosy-crimson. 1½ to 2 feet. China.
- I. Olga*. Bright-rose, 3 feet. Turkestan.
- I. variabilis*. Pink, very free, 1½ foot.

Inula.—Large-flowered Composites, a few of which are useful for the border. In hot summers they grow with great vigour and produce large Sunflower-like heads of rich orange-yellow flowers. They succeed in any garden soil. Propagated by seeds or division.

- I. ensifolia*. Yellow (small), 6 to 8 inches. South Europe.
- I. glandulosa*. Rich old gold, 2 feet. Caucasus.
- I. grandiflora*. Deep-orange, 2 feet. Himalaya.

Ixiolirion.—A small genus of Amaryllidæ with tunicated bulbs, linear leaves, and erect scapes of umbellate clusters of bell-shaped flowers over an inch long. They are perfectly hardy, thriving in a loamy soil in a sunny border.

- I. montanum*. Bright-llac, 2 feet. Syria.
- " var. *tartaricum*. Deeper-blue.
- " var. *macranthum*. Larger flowers.

Jasione (Sheep's Scabious).—A pretty little genus of the Bell-flower family. Some of the species are annuals, and several are difficult to keep through the winter.



Fig. 442.—*Jasione* Delavay.

J. perennis is the best-known, and is a very pretty rock plant, the heads of blue flowers lasting from the end of June to August. It is about 1 foot in height, and is a native of Central and South Europe.

Lactuca.—A genus of Compositæ, only one of which deserves mention here, viz. *L. Plumieri*, the Blue-flowered Lettuce, a perennial about 5 feet in height, with striking foliage, and much-branched heads of blue Chicory-like flowers. A warm light soil suits it best. Increased by seeds.

Lathyrus (Pea).—The hardy perennial species of this useful genus are very effective in the flower-border. They have deep-feeding roots and dislike disturbance. *L. grandiflorus* is an old favourite. Its large flowers are rose-coloured, very effective, lasting a long time. These perennial everlasting Peas are most conveniently grown when trained over twiggy stakes, as they only want an occasional tie after the stakes have been firmly fixed, and soon form nice bushes.

L. grandiflorus. Bright-crimson. 4 feet. South Europe.

L. latifolius (fig. 443). Rose, 5 to 7 feet. Europe.

„ var. *albus*. White, 5 to 7 feet.

L. rotundifolius. Red, 1½ foot. Orient.

L. Sibthorpii. Crimson-purple. Greece.

Leontopodium (Edelweiss).—This essentially alpine plant is valuable on account of the beautiful downy character of its leaves, arranged in star-like fashion beneath the somewhat inconspicuous flowers. It requires a dry, sunny, elevated position in the rock garden to develop its true character. Easily raised from seeds.

L. alpinum. White, 6 inches. Europe.

„ var. *japonicum*. Larger flowers. Japan.

Leucojum (Snowflake).—Allied to *Galanthus*, the only botanical difference being the uniformity of the perianth segments in *Leucojum*. The spring-flowering *L. vernum* requires a shady bank, but the summer-flowering *L. aestivum* will thrive in full sunlight, and is the tallest and most vigorous. *L. autumnale* requires a warm, sunny position, and fairly deep sandy soil. Propagated by offsets and seeds.

L. aestivum. White, 1 to 2 feet. Europe, &c. (Britain).

L. autumnale. White. Mediterranean region.

L. hyemale. White, 6 inches. Italy.

L. vernum. White, 1 foot. Europe (Britain).

Lewisia.—Not a well-known genus, although in suitable conditions not difficult to cultivate. Prefers a well-drained position in the hottest part of the rockery, with plenty of small stones and grit around the collar of the plant, and plenty of moisture in the summer. Allied to *Calandrinia*, and, like that genus, with fleshy roots and leaves. Their flowers are large, generally white in *L. rediviva*, which has small linear leaves, whereas in *L. Tweedii* the radical leaves are from 2 to 3½ inches long. Propagated by seeds or division.

L. rediviva. White, 2 inches. California.

L. Tweedii. Blush-pink, 6 inches. California.



Fig. 443.—*Lathyrus latifolius*.

Liatris.—Interesting purple-flowered Composites, with flower-heads arranged in long spikes. The leaves are linear, and are beneath the flowers on the same stem.

Propagated by division in spring or summer, or by seeds.

- L. pyenostachya*. Bright rose-purple, 3 feet. North America.
L. scariosa. Rich dark-purple, 2 feet. North America.
L. spicata. Purple feathery spikes, 3 feet. North America.

Linaria.—A pretty genus, to which our native Toadflax belongs, and including also some pretty annuals. All the perennials are easily grown in a sunny position, and may be propagated by division as well as seeds.

- L. alpina*. Lilac to dark-purple, 4 inches. Alps.
L. anticaria. White, purple spot, trailer. Spain.
L. Cavanillisi (*antirrhinoides*). Purple, 6 to 9 inches. Europe.
L. dalmatica. Yellow, 1 to 2 feet. Dalmatia.
L. hepaticafolia. Purple, trailer. Corsica.
L. repens, var. *alba*. White, 1 foot. Europe (Britain).
L. triornithophora. Violet, 6 inches. Portugal.

Lindelophia spectabilis.—A Himalayan plant related to the Borageworts, with blue or purple flowers borne in drooping clusters. An ornamental plant for well-drained sandy soil in the border. Increased by seeds or root division.

Linnaea borealis.—A choice little native evergreen trailer, with ascending branches, clothed with small ovate leaves and ending in a twin-flowered peduncle; flowers bell-shaped, $\frac{1}{2}$ -inch long, pink, fragrant. Should be on every rockery. It prefers a cool, rather shaded position.

Linum (Flax).—Plants of elegant habit, with pretty flowers, blue, yellow, or white. The soil they prefer is a light rich one, and a rather dry situation exposed to full sunshine. Propagated by seeds or division.

- L. alpinum*. Blue, 1 foot. Europe.
L. flavum. Golden-yellow, 1 foot. South Europe.
L. perenne. Blue, 18 inches. Northern temperate regions.

Lithospermum.—A genus of the Borage family, with blue, purple, or yellow flowers. Prefers a sunny spot in the rock garden. *L. prostratum* has dark-green lanceolate hairy leaves, and Gentian-blue flowers, borne on lax panicles in May and June, and again in late autumn. Cuttings of young shoots, about 2 inches long, should be taken off with a heel in summer and inserted in a sandy soil, kept close in a frame, and shaded till rooted; then they can be kept in pots till fit to plant out in spring. A beautiful plant for the rockery, and, unlike the other species, prefers a moist soil.

- L. graminifolium*. Blue, 4 to 6 inches. Italy.
L. prostratum. Deep Gentian-blue, prostrate. Europe.
L. purpureo-ceruleum. Dark-purple, 1 foot. Europe (Britain).

Lobelia.—The perennial Lobelias are important plants for the border or flower-garden, or by the side of ponds. They flower from May to September, and when in masses have a brilliant effect. In winter they should be covered with ashes, or lifted in October and stored in boxes or cool frames in sandy soil, to be planted out again in April. The ground should be well prepared by digging and enriched with rotted manure. They dislike drought, moisture of a bog or a pond-margin exactly suiting them. Some of the new varieties of *L. fulgens* are very effective. Increased by division or seeds.

- L. cardinalis*. Crimson-scarlet, $1\frac{1}{2}$ foot. North America.
L. fulgens. Bright-scarlet, 3 feet. Mexico.
L. nyphilitica. Brilliant-blue, 2 feet. North America.

Lupinus (Lupin).—Stately plants, suitable for grouping in the herbaceous border. Most of the perennials are North American. The flowers are mostly blue or purple, rarely yellow or white. *L. polyphyllus*, the oldest and best garden species, is represented by various forms, including blue, white, and white and blue, and varying

in height from 3 to 6 feet. One known as "Somerset" has yellow flowers. They thrive in ordinary garden soil. Propagation by seeds, or division in the stronger-growing species.



Fig. 444.—*Lupinus polyphyllus*

L. arboreus. Yellow, 5 feet. California.

L. nootkatensis. Dark-blue, $1\frac{1}{2}$ foot. North America.

L. polyphyllus (fig. 444). Blue, 3 feet. California.

Lychnis.—A genus of perennials. Some of the tall growers, such as *L. chalcidonica*, are among the handsomest of summer-flowering border plants, and are of the easiest culture; while such dwarf-growers as *L. alpina* and *L. Lagasce* are suitable for the rock-work, where they grow and flower freely with charming effect. Increased by seeds, division, and cuttings.

L. alpina. Bright-rose, 2 to 3 inches. Northern regions.

L. chalcidonica (fig. 445). Brilliant scarlet, 3 feet. Russia.

L. Cornaria. Red, 18 inches. South Europe.

L. Haageana. Vermilion-scarlet, 1 foot. Japan.

L. Lagasce. Rich rose, 3 inches. Spain.

L. Viscaria splendens f. *pl.* Rose, $1\frac{1}{2}$ foot. Europe (Britain).



Fig. 445.—*Lychnis chalcidonica*.

Lycoris.—There are five species of this Nerine-like genus, but only one of them need be

included here, viz. *L. squamigera* (fig. 446), which may be grown under the same conditions as are recommended for *Amaryllis Belladonna*, to which it bears some resemblance in bulb, foliage, and size of flower. The flowers are developed in July on a scape a yard or so high; they are fragrant and coloured pink, with a tinge of gray-blue. Introduced from China in 1860, and distributed under the name of *Amaryllis Hallii*.

Lythrum (Loosestrife).—A handsome British weed, worthy of a place in a bog or by the water-side, where it will look after itself and send up annually tall, four-angled, leafy-branched stems, bearing in summer elegant cymes of red or purple flowers.

Macrotomia.—Borageworts, with harsh, hairy leaves, somewhat rare and difficult to cultivate. The oriental *M. echioides* (*Arnebia echioides*), 9 inches high, is suitable for the rockery or border, and is of easy culture. Its flowers, produced in spring and again in autumn, are yellow, with black, velvety-looking, evanescent spots. An interesting and pretty plant, and should be in every collection. Increased by seeds.

Maianthemum bifolium (*M. Convallaria*).—A Lily-of-the-Valley-like plant, which produces racemes of white fragrant graceful flowers in early summer. It grows well

in shady places, and is most effective in patches 2 feet or more across. Height 6 inches. Propagated by division. It is a rare British plant.

Malva (Musk Mallow).—A large genus containing several showy summer-flowering perennials. The flowers



Fig. 446.—*Lycoris squamigera*.

are mostly pink and white, with large satiny petals, and are pretty and useful for cutting. *M. moschata* and var. *alba* are the best known in gardens; both grow to a height of 2 feet, and are fragrant. Propagated by seeds.

Meconopsis.—A genus peculiar to the Himalaya, except *M. cambrica*, the Welsh Poppy, and *M. heterophylla*, a pretty Californian annual. *M. Wallichii*, the Blue Himalayan Poppy, is an excellent plant for moist, shady positions in the rock garden, its erect stems, 3 to 4 feet high, clothed with large Poppy-like mauve-blue flowers, with ring of pale-yellow stamens, being very ornamental. To ensure success with it, seeds should be sown in February, the seedlings being pricked out and grown in pots in a mixture of peat, loam, and sand until ready for planting out. They should be given shade, and plenty of moisture at the root.

M. cambrica. Yellow, 1 foot. Europe (Britain).

M. Wallichii (fig. 447). Bluish-mauve, 4 feet. Himalaya.

Melissa officinale (Balm) has fragrant leaves which afford the well-known odour of balm. Its native habitat, like several of the savory herbs, is the Mediterranean region. Stems 1 to 2 feet high; flowers white, Salvia-like. There is a variegated form which is used for edging. Increased by division and seeds.

Melittis melissophyllum (Bastard Balm).—A distinct plant a foot high, with broad corrugated leaves and cream-coloured Salvia-like flowers $1\frac{1}{2}$ inch long, with a crimson blotch on the lower lip. It likes shade, and is easily naturalized, flowering in May. Widely distributed

over Europe and Asia, including Britain. Propagated by seeds or division.

Merendera.—Closely related to Colchicum, and requiring similar treatment. The Spanish *M. Bulbocodium* flowers in autumn, whilst *M. caucasica* is one of the earliest spring-flowering bulbs. Both have pale pinkish-lilac flowers 3 inches high. Suitable for the rockery and small border. Increased by offsets and seeds.

Mertensia.—A beautiful genus of Borageworts. The flowers are blue or shades of blue and lilac, produced in cymes at the ends of stems about $1\frac{1}{2}$ foot in height. The leaves are of a bluish-green tint, quite ornamental in themselves. *M. virginica*, the Virginian Cowslip, thrives in a moist peaty soil in border or rock garden, and flowers

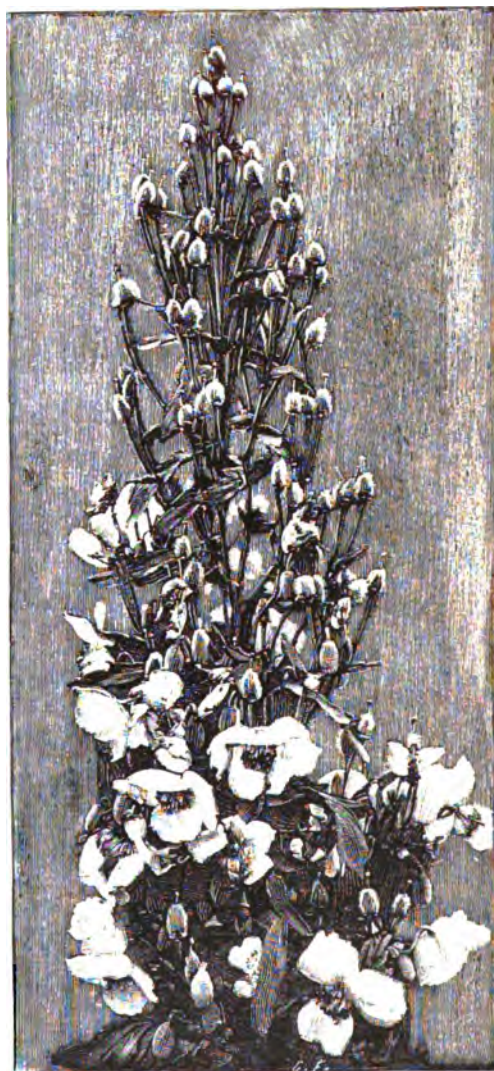


Fig. 447.—*Meconopsis Wallichii*.

in early spring. *M. sibirica* lasts longer in flower, and is of easy culture.

M. sibirica. Light-blue, $1\frac{1}{2}$ foot. Siberia.

var. *alba*. White, $1\frac{1}{2}$ foot.

M. virginica. Mauve-blue, $1\frac{1}{2}$ foot. North America.

Michauxia.—A remarkable genus related to Campanula. Two species are in cultivation, namely *M. cam-*



Fig. 448.—*Michauxia Tschihatchewii*.

panuloides, usually treated as an annual, but sometimes taking three or four years to grow to flowering size. Its stems are 3 to 5 feet high, and are clothed with large white and purple flowers. Still more striking is *M. Tschihatchewii* (fig. 448), which forms a pyramid 3 to 6 feet high, bearing large campanulate white flowers. Both species require a warm, sunny position, and to be kept in stock by means of seeds.

Molopospermum cicutarium is a stately Umbellifer which grows to a height of 5 feet or more, and has handsome fern-like foliage, forming a graceful, irregular bush, excellent for grouping purposes. It loves a deep moist soil. Propagated by seeds or division.

Monarda (Bergamot).—North American plants of the Labiate family. *M. didyma*, the best-known and most useful species, grows well in any garden soil to a height of from 2 to 3 feet, has quadrangular stems and cordate fragrant leaves, and deep-scarlet flowers in heads or whorls. There is a variety with whitish flowers. Excellent plants for naturalizing.

Morina longifolia.—A Thistle-like Himalayan plant, related to Dipsacus. Its bright-green leaves form a

rosette, from which arises the flower-stem, 2 to 3 feet in height. The blossoms are white and rose-pink, tubular, and surrounded by a spiny cup-like bract. The only safe way of propagation is by seeds.

Morisia hypogaea.—A charming little alpine, native of Sardinia and Corsica. Its bright-yellow flowers, produced in great profusion in spring and summer, contrast well with the dark shining-green of the flat rosettes of much-cut leaves. Suitable for rockery or pot cultivation. Seeds should be sown as soon as ripe. These often bury themselves in the soil, and seedlings spring up all round the old plants.

Muscari (Grape Hyacinth) (fig. 449).—Charming early spring-flowering bulbs, with flowers mostly of different shades of blue, on scapes 4 to 8 inches high. Excellent plants for naturalizing, for edging borders, and also to grow in pots. The bulbs are cheap, and so easily grown and effective when in flower that it is a wonder they are not planted in greater quantities. Increased by offsets, which are freely produced, or by seeds for some of the best varieties.

M. botryoides. Blue, 1 foot. Europe.

M. conicum. Brilliant-blue, fragrant, 1 foot.

M. neglectum. Dark-blue, with white ring. Mediterranean regions.

Myosotidium mobile.—The Chatham Island Forget-me-not. In South Cornwall it forms a Rhubarb-like clump of cordate glossy-green leaves a foot high, and produces large loose corymbs of blue and white flowers. Where it finds congenial conditions it is a worthy garden plant. Propagated by division.

Myosotis (Forget-me-not).—There are several little alpine gems in this genus, most valuable for the rockery and bog garden. *M. alpestris* is a charming rockery plant, with brilliant deep-blue flowers, thriving in moist, gritty soil. There are several varieties of it, with white and rose flowers. *M. Rehsteineri* loves a moist position, and when once established it spreads rapidly. Propagated by seeds.

M. alpestris (fig. 450). Light blue. Europe (Britain).

M. caespitosa, var. *Rehsteineri*. Large sky-blue flowers, 4 inches. Lake of Geneva

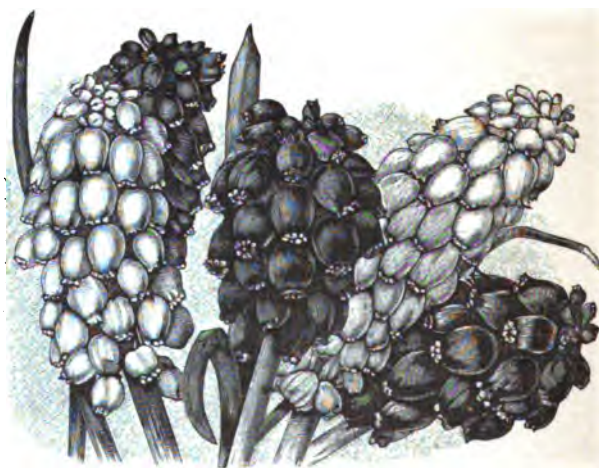


Fig. 449.—Grape Hyacinth.

Nierembergia rivularis, from Argentina, is the only one of about twenty species which is hardy and worth

growing. It has prostrate stems and leaves, and the large flowers are creamy white, slightly raised above the plant. To be seen to advantage it should be grown in broad



Fig. 450.—*Myosotis alpestris*.

patches in a moist position in the rock garden. Increased by cuttings or division in spring.

Oenothera (Evening Primrose).—Plants of easy culture, preferring rather sandy soil and a warm, sunny position. Suitable either for the shrubbery, mixed border, or rockery. The flowers are yellow, white, pink, or purple, large and solitary, in some species opening only in the evening, when they are delightfully fragrant. They are very variable in height, *O. Lamarckiana* (a biennial) being 5 feet, while *cæspitosa* is prostrate. Propagation by division in early spring or by seeds.

O. fruticosa. Yellow, 2 feet. North America.
 " *var. linearis*. Yellow, 6 inches.
O. macrocarpa. Large yellow, trailing. North America.
O. marginata (cæspitosa). Snowy-white, fragrant, 6 inches. North-west America.
O. speciosa. White, 2 feet. North America.
O. tetraptera, var. rosea. Rose, 1 foot. Mexico.
O. triloba. Large, yellow, 1 foot. North America.
O. Youngii. Deep golden-yellow, 2 feet. North America.

Omphalodes.—Pretty rock or mountain plants belonging to the Boraginaceæ family, containing annual, biennial, and perennial plants with white or blue flowers. They are of easy culture in moderately good soil. *O. verna* has deep-blue flowers, produced in early spring and resembling Forget-me-not, but larger. There is a white variety, *alba*. It prefers a shady situation, increasing itself by runners where established. Propagated by seeds or division in spring.

Onosma.—Handsome quick-growing Borageworts, with very hairy leaves. Some are difficult to keep during our damp winters. *O. echioides* (Golden Drop) (fig. 451), the best of them, should be grown in loam and grit in a dry, sunny position in the rock garden. It has scorpioid clusters of bright-yellow tubular flowers. *O. albo-roseum* and *O. stellulatum* are suitable for pot cultivation for the cool house. All may be propagated by seeds or cuttings of the young shoots stripped off with a heel in early summer.

O. albo-roseum. Rosy-white, 9 inches. Asia Minor.

O. echioides (tauricum). Bright-yellow, 1 foot. Europe.

O. stellulatum. Yellow or white, 6 inches. Europe.

Orchis.—Several species of Orchis are of general usefulness in the garden. Where the conditions are favourable they grow vigorously, and are most effective when in flower in May or June. They prefer a sunny position, a good loamy soil, plenty of moisture without stagnation, and they are very impatient of disturbance at the root. Propagated by division.

O. foliosa. Purple, 2 feet. Madeira.

O. latifolia. Purple, 1 foot. Europe (Britain).

O. maculata. Purple, 1 foot. Europe (Britain).

Ornithogalum (Star of Bethlehem).—

Bulbous plants of the Lily order, mostly natives of South Europe and North Africa. They are useful for naturalizing in grass, for planting in the border, or as



Fig. 451.—*Onosma echioides*.

pot plants. The flowers are silvery-white or white and green, and are very attractive when the sun is shining on them.

O. nutans. Green and white, 1 foot. Europe (Britain).
O. pyramidalis. White, 18 inches. South Europe.
O. umbellatum. White, 18 inches. Europe, &c. (Britain).
 And others.

Ostrowskia magnifica (Giant Bellflower) (fig. 452).—The only species, native of Turkestan. The flowers are



Fig. 452.—*Ostrowskia magnifica*.

large, bell-shaped, and of a delicate purple colour, with darker veins. It prefers a deep loamy soil, and even then does not thrive in some gardens; it also needs extra care in planting and protection. The large Parsnip-like roots are fleshy and very brittle, so should be handled carefully, and in winter protection should be given by means of a hand-light or pine-needles strewn over the surface. Height 3 to 5 feet.

Oxalis.—A cosmopolitan genus of over 200 species, a few of which are hardy. They are dwarf, pretty plants, with fleshy tubers or root-stocks. The leaves are usually trifoliate, but in *O. enneaphylla* (fig. 453), one of the best of the hardy kinds, the leaflets vary in number from 9 to 15. It bears large white flowers in May. Being a native of the Falkland Islands, it should be given a moist and shady position in the rock garden, protecting it from excessive moisture in winter with a sheet of glass. Other species are pretty enough for the garden, but they are apt to become a nuisance, as they spread so rapidly by means of seeds and bulbils and are not easily eradicated.

Oxytropis.—Plants of the Pea family, nearly allied to *Astragalus*, inhabiting the colder portions of the North Temperate Zone. The flowers are purplish-lilac, blue, or yellow; leaves silky and pinnate. A sandy loam suits them in an open spot on the rockery. Propagation by seeds or division.

O. campestris. Lemon-yellow, 6 inches. Temperate regions
O. pyrenaica. Lilac, 6 inches. Pyrenees.
O. uralensis. Purple, 6 inches. Europe, &c. (Britain).

Pæonia.—A genus of many species, varieties, and hybrids; excellent for massing in beds or for naturalizing in the wild garden, &c. The young leaves in spring are of a bronzy or red purple hue, and combine effectively with the yellow trumpet Daffodils, which may be grown in the same beds. The flowers, which are shades of crimson, pink, and white, develop in May, and keep up a succession all through June. Pæonies should be planted in autumn in loamy soil, and a heavy watering should be given after planting. They are subject to a malignant fungoid disease which attacks them in spring and destroys all the young growths. Lime dressings may arrest it. But prevention is better than cure, and in this case excessive manuring is supposed to be the cause. If the soil is good the plants are better without manure. They can be left to take care of themselves for a dozen years or so. The shoots should be well thinned as soon as they can be handled, or the plants will be weakened through excess of growth. (See also special chapter.)

P. anomala. Rose-lilac. Siberia.
P. arietina. Crimson. Orient.
P. Bakeri. Crimson.
P. Broteri. Crimson. Spain.
P. corallina. Deep-crimson. Europe, &c. (Britain).
P. decora. Crimson. Thrace, Asia Minor.
P. officinalis and vars. Europe

Papaver.—Most useful plants for border, wild garden, or rockery. *P. orientale* is the showiest and best. Its flowers are large and pure scarlet. The var. *bracteatum* is still larger, and is distinguished by black patches in the form of a cross at the base of the petals. There are several other forms, some of them crosses between *P. orientale* and *bracteatum*. *P. alpinum* is a delightful little alpine, the colours of its flowers ranging through shades of rose, buff, orange, and yellow to white; it continues to flower from May to September. *P. nudicaule*, the Iceland Poppy, has pretty golden-yellow flowers on



Fig. 453.—*Oxalis enneaphylla*.

naked flower-stems 1 foot in height. See also under ANNUALS.

P. alpinum. Mixed, 6 inches. Europe.
P. nudicaule. Golden-yellow, 1 foot. Alpine and Arctic regions.
P. orientale. Vivid scarlet, 2½ to 3 feet. Asia Minor.
 " var. *bracteatum*. Deep-red, black blotches, 2½ feet.
P. pilosum. Orange, 2 feet. Greece.

Parnassia (Grass of Parnassus).—Bog plants of great beauty. The flowers are white or yellow, with five stamens on the inner side of the petals bearing globular-headed filaments. *P. palustris* is one of the most beautiful



Fig. 454.—*Parnassia palustris*.

of our native plants. *P. nubicola* is useful for pot cultivation. *P. fimbriata* has pretty fringed petals. All grow in moist peat soil.

P. fimbriata. White, fringed petals, 9 inches. North America.
P. nubicola. Large white, 9 to 12 inches. Himalaya.
P. palustris (fig. 454). White, 9 to 12 inches. Northern Hemisphere.

Pentstemon.—Late summer and autumn flowering plants, with handsome tubular flowers. Besides the popular hybrid forms there are several species and varieties well worth a place in the mixed border. They grow freely in any good soil, but a sandy loam, to which well-rotted manure has been added, suits them best. Good drainage is another essential, for they more often succumb owing to the lack of it than to cold. In some localities they are not hardy, and for the winter should be lifted and stored in a cold frame, or cuttings taken in the summer. Propagation by seeds, cuttings, or division. (See also special chapter.)

P. barbatus. Coral-red, 3 feet. West United States.
P. campanulatus. Blue, 18 inches. Mexico.
P. glaber. Light to dark blue, 1 foot. West United States.
P. humilis (fig. 455). Blue-purple, 8 inches. Rocky Mountains.
P. ovatus. Purplish-blue, 3 feet. North-west America.
P. Scouleri. Lilac-blue, 2 to 3 feet. North America.

Phlox.—Summer and autumn flowering border plants. The dwarf kinds are suitable for the rockery. There are numerous named varieties of *P. suffruticosa* and *P. decussata*, which include all shades of colours. The varieties of the first-named are somewhat dwarfer, and flower earlier than those of *P. decussata*, which come into flower in July and continue into September, carrying large heads of bloom 2 or 3 feet high. They are subject to a fungous disease identical with that which attacks Pæonies, and probably due to the same cause,

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viz. excessive manure. The trailing dwarf kinds are ideal rock plants. They succeed well in ordinary soil, and should be propagated by cuttings under glass in sandy loam. (See also special chapter.)

P. amœna. Bright-rose, 4 inches. North America.
P. divaricata. Soft-blue, 1 foot. North America.
 " var. *alba*. White.
P. lilacina. Mauve, 6 inches. North America.
P. ovata. Large deep-rose, 1 foot. North America.
P. reptans. Deep-rose, 6 inches. North America.
P. setacea. Rose, 6 inches.
P. subulata. Rose-pink, 6 inches. United States.

Phygellus capensis, allied to *Pentstemon*, is a handsome border plant 3 to 6 feet high, with spikes of bright-scarlet tubular flowers in autumn. It succeeds in a sunny position in ordinary garden soil, though it thrives better on a border under a wall. It forms a large shrub in south Cornwall, where it is sometimes trained against the walls of houses. Increased by portions of the root-stock. It is a native of South Africa.

Physalis.—Ornamental plants of the Potato family, with perennial underground stems, annual upright shoots, bearing light-green leaves, small white flowers, and large bladdery bright-scarlet fruits. *P. Franchetti* is the best of the genus, being larger than *P. Alkekengi*, the older species, both in leaves and fruit, the inflated calyces of the former being quite 3 inches in length and of a very bright orange-red. A preserve is made of the fruits. A



Fig. 455.—*Pentstemon humilis*.

light warm soil in a sunny position suits them. Propagation by division or seeds.

P. Alkekengi. Bright-orange fruits, 1½ foot. Europe.
P. Franchetti (fig. 456). Bright-orange fruits, larger than the first-named, 1 to 3 feet. Japan.

Physostegia.—Summer-flowering plants, allied to *Dracocephalum*, with pretty erect spikes of pinkish and white flowers. They thrive in the ordinary border, and may be increased in spring by division.

P. virginiana. Pink, 2 feet. North America.
 " var. *alba*. A good variety. White.
 " var. *imbriata*. Pink, 4 feet.

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Phyteuma.—Attractive plants, related to the Campanulas, and suitable for the rock garden or herbaceous border. The flowers, which are mostly blue, are arranged



Fig. 456.—*Phytalis Franchetti*.

in spicate or globular heads. *P. comosum* is a very dwarf species, with lilac-coloured flowers, tipped with dark purple, arranged in heads, and growing quite close to the root-stock. Readily increased by seeds, which are ripened very freely.

- P. comosum*. Lilac, tipped purple, 3 inches. Europe.
P. Halleri. Violet, 1 to 2 feet. Europe.
P. Michelii. Mauve, 9 inches. Europe.
P. Scheuchzeri, var. *Charnetii*. Mauve, 1 foot.
P. spicatum. Pale-lilac, 2 feet. Europe.

Platycodon.—Related to Campanula, having a broad belled corolla, inflated like a balloon, hence the popular name Balloon-flower. They make nice border plants, but are charming for the rockery, where a good, deep, sandy loam with a partly-shaded position is best for them, and helps to prolong their flowering season. They flower in July.

- P. grandiflorum*. Deep-blue, 1½ foot. China and Japan.
 var. *Mariesii*. Deep-blue, 9 to 12 inches.
 var. *Mariesii album*. White, 9 inches.

Podophyllum (May Apple).—A small genus of large-leaved plants growing about 1 foot in height, with white flowers and handsome coral-red, scarlet, or yellow fruits, egg-shaped, 2 inches long. They require a moist, shady position, and may be increased by division at the roots.

- P. Emodi*. White, fruit coral-red, 1 foot. Himalaya.
P. peltatum. White, fruit pale-yellow, 1 foot. North America.
P. pleianthum. Dull-purple, 1 foot. China.

Polemonium (Jacob's Ladder).—Quick-growing, pretty, blue-flowered plants with pinnate leaves. Almost any soil and situation suit them. Readily increased by seeds. *P. caeruleum* is a doubtful native of Britain. Its variegated form is pretty.

- P. caeruleum*. Blue, 2 feet. Northern temperate region.
P. himalayanaum. Azure-blue, 2½ feet. Himalaya.
P. humile. Pale-blue, 4 inches. North America.
P. reptans. Slaty-blue, 9 inches. North America.

Polygonatum (Solomon's Seal).—Graceful plants for naturalization, or shady, moist corners where little else will grow; also very useful for early forcing. They have pretty arching stems, with white or greenish flowers, borne singly or several together, in the axils of the leaves. Increased by seeds or division.

- P. multiflorum*. White fragrant flowers, 2 feet. Europe (Britain).
P. officinale. White, 3 feet. Europe and Himalaya (Britain).

Polygonum.—A large genus, some of the species being valuable garden plants. *P. cuspidatum* is a good plant for the wild garden, or where a screen is desired, but it may prove troublesome in more select positions, as its Raspberry-like suckers are very persistent and difficult to eradicate. Its flowers are white and attractive, in spikes produced from the lateral branches. *P. affine*, a dwarfier kind, is very pretty in a mass, with its dense rosy spikes of flowers. Propagation by division, seeds, or cuttings.

- P. affine*. Rose, 6 to 9 inches. Himalaya.
P. amplexicaule. Crimson, 2 feet. Himalaya.
P. cuspidatum. White, 5 to 8 feet. Japan.
P. saochalinense. White, 10 feet. Island of Sachalin.
P. sphaerostachyum. Deep-crimson, 1 foot. Himalaya.
P. vaccinifolium (fig. 457). Pink, 6 inches. Himalaya.



Fig. 457.—*Polygonum vaccinifolium*.

Potentilla (Cinquefoil).—Strawberry-like plants, succeeding in ordinary soil in a sunny position. The dwarf species are worth a place in the rockery. The double-flowered varieties are very effective in the border, and

are among the most popular of flowers. Propagated by seeds or division.

P. alchemilloides. White, 1 foot. Pyrenees.

P. argyrophylla. Bright golden-yellow, 1 to 2 foot. Himalaya.

P. Hopwoodiana. Pink and white, 1½ foot. Garden variety.

P. nepalensis. Cherry-red, 1½ foot. Himalaya.

P. nitida. Soft-pink, silvery foliage, 2 to 3 inches. Europe.

P. pyrenaica. Brilliant-yellow, 1 foot. Pyrenees.

P. recta. Yellow, 1½ foot. Europe.

P. tridentata. White, 2 to 3 inches. North America.

P. villosa. Yellow, 3 inches. Siberia.



Fig. 458.—*Primula capitata*.

Primula.—An extensive genus of great beauty. Many of the Alpine species are difficult of cultivation in English gardens. They seem to require a gritty soil, and while growing to be kept cool and moist, but in the autumn and winter moisture is frequently detrimental, especially if it is allowed to get in the crown of the plant. Some of the Himalayan species are much more easily grown in a rather shady, moist position, and where they thrive they are very beautiful. *P. rosea* is happiest when treated as a bog plant. Propagation by division and seeds.

P. acaulis. Yellow, 6 to 9 inches. Europe.

P. auricula. Bright clear-yellow, 4 inches. Europe.

P. denticulata. Bright-lilac, 1 foot. Himalaya.

" var. *capitata* (fig. 458). Violet-blue, 1 foot.

" var. *cashmiriana*. Pale-lilac, 1 foot.

P. frondosa. Rosy-lilac, silvery leaves, 4 inches. Thrace.

P. japonica. Crimson, white, pink, variegated, &c., in whorls on erect spikes, 1 to 1½ foot. Japan.

P. longiflora. Bluish-purple, 6 inches. Europe.

P. marginata. Rosy-violet, 6 inches. Switzerland.

P. mollis. Deep-red, 9 inches. Himalaya.

P. rosea (fig. 459). Bright-rose, 9 inches. Himalaya.

P. sikkimensis. Yellow, 1 to 1½ foot. Himalaya.

P. viscosa. Rose, 8 inches. Europe.

See also chapters on *Polyanthus* and *Primrose*.

Prunella (Self-heal).—Pretty *Salvia*-like plants 9 inches to 1 foot in height, with dense spikes of violet or purple flowers. They are suitable for the rockery or the front row of the border. *P. grandiflora* is the best species, the flowers being a rich violet-purple colour. *P. vulgaris* var. *laciniata* is a cut-leaved desirable plant, with deep-purple flowers. A light, rich soil suits them, with a somewhat shaded position. Propagation by seeds or division.

Pulmonaria (Lungwort).—Useful, early purple flowered plants with pretty marbled and spotted leaves.



Fig. 459.—*Primula rosea grandiflora*.

They thrive in ordinary soil, and succeed best in shade. *P. arvernense*, 9 to 12 inches high, has clusters of deep

Gentian-blue flowers, produced in early spring. Propagated by division.

- P. arvernense*. Deep Gentian-blue, 9 to 12 inches.
P. mollis. Blue and mauve, 9 inches. Central Europe.
P. saccharata. Rose and blue, 1 to 1½ foot. Europe.

Ramondia.—Hardy Gesneriads, with rosettes of crinkled, leathery, hairy leaves and brilliant lilac-blue or white flowers in early summer. They are of easy culture in the rock garden in a moist, shady position,



Fig. 460.—*Ramondia pyrenaica*.

if planted in crevices of crumbling rock and soil, on vertical surfaces, and where the sun's rays do not reach them. *R. pyrenaica* (fig. 460) is the best-known species, and has dark-green leaves, with racemes of beautiful lilac-blue flowers 6 inches high. There is also a white-flowered variety. Propagated by division or seeds. Native of the Pyrenees.

Ranunculus.—The double forms of *R. acris* and *R. aconitifolius* are well-known old-fashioned garden plants, familiarly known as "Bachelors' Buttons" and "Fair Maids of France". They flower early in summer, and are useful for cutting. There are a few dwarf alpine species suitable for the rock garden. A moist, loamy soil suits them, adding plenty of stones and grit for the alpine members of the genus. *R. Lyallii*, one of the most beautiful, requires peaty soil and shade in a sheltered position.

- R. amplexicaulis*. White, 3 inches. South Europe.
R. anemonoides. White, pinkish tinge, 6 inches. Styria.
R. gramineus. Golden-yellow, 9 to 12 inches. Europe (Britain).
R. Lyallii. White, large, fleshy, peltate leaves, 18 inches. New Zealand.

Rheum (Rhubarb).—Bold large-leaved plants, effective for half-wild places or near water, where the glossy wrinkled foliage and tall flower-spikes are seen to the best advantage. They like rich, deep soil, and will take care of themselves after planting. *R. officinale*, a native of Thibet, has very effective foliage, and it, with *R. Emodi* from the Himalayas, and *R. palmatum* var. *tanguticum*, are good plants for isolating on lawns or near the shrubbery. They grow to a height of 6 feet.

Rodgersia podophylla.—A Japanese plant, with handsome bronzy foliage and creamy-white flowers arranged in a panicle. It delights in a damp, sheltered, partially-shaded position and peaty soil. Height 2½ feet.

Romulea.—Bulbous plants, allied to Crocus, hardy only in very favoured localities, on a warm, sheltered

border. They can be perfectly grown in a cold frame. The foliage is grass-like, and the bell-shaped flowers, which are lilac, creamy, or rose, expand only when exposed to full sunshine.

- R. Bulbocodium*. Rose-purple, 4 inches. South Europe.
 " var. *pylla*. Creamy-white.
R. Linarestii. Bluish-purple, 3 to 4 inches. Europe, Asia Minor.
R. rosea. Rose, 4 inches. South Africa.

Rudbeckia.—Decorative plants for shrubberies, the rougher parts of rockeries, and borders. They are also effective in lawn-beds by themselves. Common garden soil suits them. Increased readily by division or seeds.

- R. hirta* (fig. 461). Yellow, 2 feet. North America.
R. laciniata. Clear-yellow, 4 to 6 feet. North America.
 " var. *Golden Glow*. Large double flowers, 6 feet.
R. maxima. Large, yellow, black disk, 6 feet. Texas.
R. Newmanni. Orange, dark centre, 12 feet. North America.

Salvia.—Most of the ornamental plants of this genus are too tender for the open-air garden. A few, however, are deserving of mention here, as they are easily grown, and form compact bushy plants bearing an abundance of pretty bright-coloured flowers. Suitable for the herbaceous border. Increased by seeds or division.

- S. argentea*. White, ornamental foliage, 3 feet. Mediterranean region.
S. hians. Deep-violet, 2½ feet. Himalaya.
S. pratensis. Deep-blue, 2 feet. Europe (Britain).
S. virgata. Purplish-blue, 3 feet. Europe.
S. viscosa. Yellow, 3 feet. Syria.

Sanguinaria canadensis (Blood-Root).—A distinct plant, with creeping fleshy roots, bearing annual leaves about 6 inches high, and producing in May large white Anemone-like flowers singly on stems as high as the leaves. It grows well under the shade of trees. The roots should be planted in autumn in a place where they need not be disturbed for several years. They are happiest in a bed



Fig. 461.—*Rudbeckia hirta*.

or border beneath loose-growing or deciduous shrubs. Native of North America.

Saponaria (Soapwort).—Plants of the Pink family, suitable for the rockery. *S. ocymoides* is a charming, compact-growing plant, bearing rosy-crimson flowers in early summer. It thrives on old crumbling walls. *S. officinalis* f. *pl.* is an excellent plant for wild places, having soft rosy-white flowers, most effective when planted in the mass on banks or in rough places.

- S. caespitosa*. Pink, 1 to 2 inches. Pyrenees.
S. lutea. Yellow, 2 inches. Europe.
S. ocymoides. Rosy-crimson, a trailer. Europe.
S. officinalis f. *pl.* Rosy-white, 1½ foot. Europe (Britain).

Sarracenia.—*S. purpurea*, the hardiest of the North American Pitcher-plants, is remarkable as well as hand-



Fig. 462.—*Saxifraga apiculata*.

some, its leaves being hollowed out like a horn, blood-red, and about 10 inches long. A good plant for the bog garden, where it should be planted in peat, with a layer of living sphagnum about it to keep it moist. It does not often flower in the open air. *S. flava* and *S. variegata* may be grown outside in the warmest parts of this country.

Saxifraga.—An invaluable genus for the alpine and rock garden, the large-leaved species, such as *S. cordata*, *S. crassifolia*, and *S. ligulata*, being useful for the border. *S. Stracheyi* flowers so early that it is apt to be injured by frost. It has thick contorted stems, large ovate fleshy leaves, and big clusters of handsome flowers. Is happy when planted about large stones. The crusted species grow best when fully exposed to sunshine and with plenty of grit and stones, and for some species chalk mixed with the soil. *S. Burseriana*, with its varieties *major* and *macrantha*, are among the best of early-flowering plants. They are often in flower in January. *S. oppositifolia* and varieties are other early-flowering gems. A sure and easy method of increasing these *Saxifragas* is to make cuttings of the tiny rosettes or branches, and plant them in pots of very sandy soil, keeping them moist and shaded for a few days. The Mossy section, which is more valuable to us in winter on account of its carpeting character and beautiful colouring, is best propagated by division when the patches get worn in the middle, giving fresh soil, and planting the little pieces firmly. Propagation is effected also by seed, but the spike of flowers should be covered with a light gauze-bag if intended for seed, as cross-fertilization is easily effected by bees.

Encrusted Saxifragas.

- S. aizoon* and var. White, 6 inches. Northern regions.
S. casia. White, 2 inches. Alps of Europe.

- S. cochlearis*, var. *minor*. White, 3 inches.
S. Cotyledon. White, in racemes, 18 inches. Europe (Britain).
 var. *pyramidalis*. Longer flower racemes.
S. crustata. White, 6 inches. Alps of Europe.
S. longifolia. White, 1 foot. Pyrenees.
S. Rocheliana. Snow-white, 2 inches. Eastern Europe.
S. valdensis. White, 2 inches. Piedmont, &c.

Mossy Saxifragas.

- S. caespitosa*. White, 3 inches. Northern regions.
S. decipiens. White, 3 inches. Europe (Britain).
S. Hawthorii. White, 6 inches. Europe.
S. hypnoides. White, 3 to 4 inches. Europe (Britain).
S. Iratiana. Creamy-white, 3 inches. Pyrenees.
S. Maueana. Large white, 4 inches. North Africa.
S. muscoides. Small white, 3 inches. Europe (Britain).
 var. *purpurea*.
S. Wallacii. Large pure-white, 9 inches. Spain.

Other Saxifragas.

- S. apiculata* (fig. 462). Sulphur-yellow, 4 inches.
S. Boydii. Lovely primrose-yellow, 3 inches. Garden hybrid.
S. Burseriana. White, 3 inches. Eastern Europe.
S. cordifolia. Pink, 1 foot. Siberia.
S. crassifolia. Pink, 12 to 18 inches. Siberia.
S. oppositifolia. Purple-rose, 2 inches. Northern regions.
S. pseudo-santa. Yellow, 2 inches. Thrace.
S. sancta. Bright-yellow, 2 inches. Macedonia.
S. Stracheyi (fig. 463). White, purple eye, 6 inches. Himalaya.

Scabiosa.—Handsome border plants, with flowers in heads on long naked scapes. They are useful for cutting, lasting a long while in water. Almost any soil suits them. Perhaps the best species is *S. caucasica*, which has mauve-blue flower-heads sometimes 3 inches across. Propagated by seeds or division.

- S. arvensis*. Blue, 2 feet. Europe (Britain).
S. caucasica. Lilac-blue, 3 feet. Caucasus.
 var. *alba*. Large white, 3 feet.
S. graminifolia. Pale-violet, 1½ foot. South Europe.



Fig. 463.—*Saxifraga Stracheyi*.

Scilla (Squill).—A charming genus of spring, summer, and autumn flowering bulbs. They are best when planted

in masses, either in woodland or beneath deciduous shrubs. The native Bluebell, *S. nutans*, is particularly effective in woodland or copse, and where in such places it does not grow naturally it should be planted. *S. sibirica* and *S. bifolia* are pretty in spring if planted thickly in bare places in the rockery or under shrubs. They may be naturalized in woods, &c., by means of seeds sown broadcast as soon as ripe, or the bulbs may be planted as if they were Onions in autumn. *S. italica* is a sweet-scented species which flowers in April.

S. bifolia. Blue, 6 inches. Asia Minor, Europe (Britain).
S. italica. Blue, tinged mauve, 1 foot. South Europe.
S. sibirica. Bright-blue, 9 inches. Asia Minor.
S. verna. Blue, 9 inches. Western Europe (Britain).

Sedum (Stone-crop).—An extensive genus, pre-eminently suitable for the rock garden on account of the dwarf and spreading habit of most of the species. Several, however, are good border plants, among them being *S. spectabile*, an autumn bloomer, with grayish-green succulent leaves and rosy-purple flowers. Sedums will grow in any place if fully exposed to the sun. They are unequalled for clothing rocks and old walls with picturesque effects. The leaves vary both in colour and shape, while the flowers are usually white, pink, or blue.

S. Acre. Yellow, 2 inches. Europe (Britain).
S. album. White, 2 to 3 inches. Europe (Britain).
S. asiaticum. Reddish-orange, 9 inches. Himalaya.
S. brevifolium. Gray-green, dwarf. Mediterranean region.
S. dasyphyllum. White, dwarf. Europe (Britain).
S. maximum. Stems and leaves purplish, 1 foot.
S. pulchellum. Purple, 6 inches. North America.
S. roseum. Red, 6 inches. North temperate regions.
S. Sieboldii. Rose-pink, 6 inches. Japan.
 var. variegata. Variegated leaves.
S. spectabile. Pinkish-purple, 1½ foot. Japan.
S. stoloniferum. Purple, 3 inches. Asia Minor.
 Several varieties.
S. Telephium, and *vars.* White to purple, 1 to 2 feet. Europe (Britain).

Sempervivum (House-leek).—A large genus of succulents, the leaves arranged in rosettes, sometimes prettily tinged with red, or with a spider-like web entwined about the tips of the leaves. They grow well in light sandy or stony soil on walls or rough parts of the rock garden, and multiply rapidly by means of offsets. The flowers are arranged in cymes on fleshy stems, either deep-reddish colour or yellow. *S. calcareum* is one of the largest, and is useful for the border as well as the rock garden. *S. arachnoideum*, the Cobweb House-leek, is a pretty little plant which bears spikes of rose-coloured flowers in summer.

S. arachnoideum. Pink, 2 inches. Europe.
S. calcareum. Pale-red, 6 inches. Dauphiné.

Senecio.—A very large genus, many species of which are weeds. There are, however, a few perennials worth including in a good collection of herbaceous plants. *S. ineanus* and *S. uniflorus* are dwarf silvery-leaved alpine, somewhat difficult to keep in health on the rockery. *S. macrophyllus*, from the Caucasus, is a noble foliage plant with large glaucous leaves. It grows well near water, and sends up in autumn tall spikes of yellow flowers. *S. japonicus* is another of similar character to the last-named, but is not so tall, and has pedately cut leaves. *S. pulcher*, from South America, has large, handsome, brilliant purplish-crimson flowers with golden centre. Height 2 to 3 feet.

Shortia.—Two species of beautiful little alpine, which are rare in cultivation. *S. uniflora*, from Japan, is not so easily grown as the North American *S. galacifolia* (fig. 464). The leaves of the latter assume in autumn a

lovely crimson and green colour. The flowers, produced in early summer, are of a pearly whiteness. They grow best in shady positions, in a mixture of peat and sand. The leaves are ovate, shining-green, somewhat rigid, and



Fig. 464.—*Shortia galacifolia*.

the campanulate flowers are borne singly on stalks about 6 inches high.

Sidalcea.—Handsome plant of the Mallow order, most of the species having satiny white and pink flowers in pyramidal heads 2 to 3 feet high. They make pretty plants for the border or rockery, and thrive in ordinary soil. Propagation by seeds.

S. candida. White, 3 feet. New Mexico.
S. Listeri. Pink, 3 feet. Garden origin.
S. malvaeflora. Rose-pink, 2½ feet. North-west America.

Silene (Catchfly).—This genus contains some good dwarf Alpines of easy culture and very effective in the rock garden, besides many which are difficult to determine apart, and which are worthless from a garden point of view. They flower in summer and autumn and are easily propagated from seeds.

S. acaulis. Rose-pink, 2 inches. Northern regions.
S. alpestris. White, 4 inches. Alpa.
S. maritima. White, trailer. Europe (Britain).
S. pumilio. Rose, 4 inches. Tyrol, &c.
S. quadrifida. White, 4 inches. Europe.
S. Schafta. Deep-rose, 5 inches. Caucasus.

Silphium.—Robust yellow-flowered Composites, not unlike the large Sunflowers, flourishing in any soil, and very effective for planting in masses, either among shrubs or in the wild garden. Propagation by seeds.

S. laciniatum. Yellow, 9 feet. North America.
S. perfoliatum. Bright-yellow, 4 feet. North America.
S. terebinthaceum. Yellow, 5 feet. North America.

Soldanella.—A charming alpine genus belonging to Primulaceæ. The leaves are roundish, thick, dark-green, and leathery, the flowers, which are lilac or purple in colour, bell-shaped, and beautifully fringed, being produced on stalks 6 inches high. A very moist, shady situation is their chief requirement, a mixture of peat, loam, and sand suiting them well.

S. alpina. Pale-purple, 4 to 6 inches. Alpa.
S. pyrolaefolia. Purple, 6 inches. Alpa.

Spigelia marilandica (Indian Pink).—A North American plant, delighting in moist boggy situations. It has

showy tubular red and yellow flowers. Prefers a mixture of loam, leaf-mould, and peat, with plenty of sand; and partial shade. Propagation by cuttings.

Spiræa (Meadow-sweet).—Handsome plants related to the Hawthorns and mostly shrubby in habit. The small flowers are usually whitish, tinged with yellow or purple, and are produced in feathery plumes, ranging from 1 to 6 or more feet in height. The species included here delight in a rich, moist soil, and are ornamental when planted on the margin of lakes or streams or in the bog garden. Increased by division or seeds.

S. Aruncus. Whitish, 3 to 4 feet. Northern regions.

S. astilboides. White, 2 feet. Japan.

S. Filipendula fl. pl. Double, white, 2 feet. Europe (Britain).

S. palmata. Rosy-crimson, 2½ feet. Japan.

S. Ulmaria. Creamy-white, 2 to 4 feet. Europe (Britain).

Statice (Sea-Lavender).—Beautiful plants of the Thrift family, suitable for the open border or rockery. The flowers, which are bluish in most of the species, have scarious petals crisp to the touch, and retain their colour all winter if cut and dried before they fade. Propagation by seeds.

S. Fortunei. Yellow, 9 inches. China.

S. Gmelini. Deep-lavender, 2 feet. Caucasus.

S. latifolia. Lavender-blue, 2½ feet. Bulgaria.

S. Limonium. Deep-blue, 2 feet. Europe (Britain).

„ var. *alba*. White, 2 feet.

Sternbergia.—Bulbous plants related to *Amaryllis*, but with flowers not unlike those of *Crocus*. They are

foliage and yellow flowers. They prefer a light, rich soil, and should be left undisturbed. Propagation by seeds.

S. diphyllum. Yellow, 2½ feet. North America.

S. japonicum. Yellow, 2 to 3 feet. Japan.

Symphyandra.—Related to *Campanula*. The flowers are cream, lilac, or dark purplish-blue, and bell-shaped; but the anthers are connate, whilst in *Campanula* they are free. Two of the best species are biennial, viz. *S. Hofmanni*, with white flowers, and *S. Wanneri*, reddish-purple flowers.

S. pendula. Creamy-white, 6 inches. Caucasus.

Thalictrum (Meadow Rue).—Valuable plants for the border, and also for naturalization and shrubberies. The foliage of all is elegant and graceful, while the tall, upright racemes of creamy-white feathery flowers are particularly effective. A sandy loam suits them best, and propagation is effected either by division or seeds.

T. angustifolium. Yellow, 4 feet. Europe.

T. aquilegifolium. Yellowish, 4 feet. Europe.

T. Delavayi. Purple, 2 feet. China.

T. flavum. Golden-yellow, 4 feet. Europe (Britain).

T. minus. Creamy-white, 1 foot. Europe (Britain).

Thymus.—Pretty dwarf rock-plants with rosy flowers and fragrant foliage. They spread rapidly, and form effective cushion-like tufts, which are literally covered in summer with rose-coloured flowers. *T. Chamaedrys* and its varieties, with *T. Serpyllum* and its grayish woolly-leaved variety, *lanuginosus*, are the prettiest and best of the genus.

Tiarella cordifolia (Foam-flower).—An attractive little plant belonging to *Saxifragaceæ*, with feathery plumes of small white flowers developed in spring, and heart-shaped leaves. Suitable for a moist position on the rockery, equally happy in the herbaceous border. It grows to a height of 6 inches, and is a native of North America. There are two or three other species not often seen out of botanic gardens.

Tigridia.—Handsome flowering Mexican bulbous plants requiring extra care to do them well. Their large red, orange, or white flowers are most gorgeous. They grow best on a light, rich soil, and may pass the winter unharmed in such a position; but it is usual to lift the bulbs in November, storing them in a dry place until April, when they are again planted. In lifting, as much of the foliage as possible should be left on, the object being to prevent shrivelling of the bulbs. They grow well in moist ground in some soils, but they must have plenty of sunshine.

T. Pavonia (fig. 466). Orange-red, spotted, 4 feet. Mexico.

T. Pavonia, var. *alba*. White, spotted violet and red.

„ var. *grandiflora*.

Tradescantia (Spiderwort).—Handsome plants for the border or rock garden, useful also for shrubberies or for naturalization. They form erect bushes 18 inches in height, the flowers being produced at the ends of the branches in umbels.

T. congesta. Light-blue, 2 feet. North America.

T. virginiana. Pale-purple, 1½ foot. North America.

„ var. *alba*. White, 1½ foot.

Trillium (Wood-Lily).—North American plants of great beauty, and very useful for spring effects. They

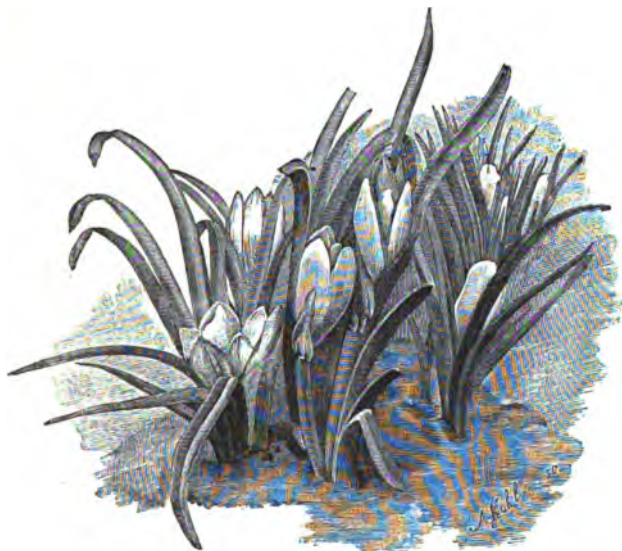


Fig. 465.—*Sternbergia lutea*.

natives of Asia Minor and the Mediterranean region. The flowers, which are bright golden-yellow, are produced in autumn, except *S. Fischeriana*, which flowers in spring. The leaves, which are developed in summer, are strap-shaped and of a dark glossy-green. They like a warm, sunny corner, similar to that which suits the *Belladonna* Lily. Increased by offsets.

S. Fischeriana. Golden-yellow, 6 inches. Asia Minor.

S. lutea (fig. 465). Bright-yellow, 6 inches. Mediterranean region.

S. macrantha. Yellow, large, 6 to 9 inches. Asia Minor.

Stylophorum.—Handsome Poppyworts with grayish

are tuberous-rooted, and all the parts of the plant are in threes in whorls. The flowers are white, or white and red, or purple. They thrive in moist, shady situations, and are suitable for such spots in the border shrubbery or rock garden.

- T. erectum*. Deep red-purple, 9 inches. North America.
T. grandiflorum. White, large, 1 foot. North America.
T. ovatum. White, small, 4 to 6 inches. North America.
T. sessile, var. *californicum*. Creamy-white, leaves purplish, 2 feet. North America.
T. stylosum. Pink, 6 inches. South United States.



Fig. 466.—*Tigridia Pavonia*.

Trollius (Globe Flower).—Showy Buttercup-like plants, thriving best in moist situations, and well suited for the bog garden. They are effective, too, in the border in moist loam. The luxuriant foliage is of a deep glossy-green, and the flowers globular, of a rich yellow or orange.

- T. asiaticus*, and vars. Bright-orange, 2 feet. Siberia.
T. europæus, and vars. Yellow, 1 to 2 feet. Europe (Britain).

Tropæolum.—Showy plants for rock garden or border, whether grown as trailers or climbers. They succeed in any light, warm soil, and are of rapid growth. They do not like to be disturbed, and once established they flower well. *T. speciosum* likes a deep, cool soil, although in some parts of the country it thrives in any soil, provided it gets plenty of sunshine. The best of the perennial species are:—

- T. Leichlinii*. Orange, traller. Garden origin.
T. polyphyllum. Yellow, traller, tuberous-rooted. Chili.
T. speciosum (fig. 467). Bright-scarlet, climber. Chili.
T. tuberosum. Scarlet and green, dwarf. Peru.

Tunica Saxifraga is suitable for the rockery, border, or old walls. It is 6 inches in height, and the flowers are

***Tritonia aurea*.**—A useful border plant in the warmer parts of the country, or it may be used for summer bedding along with *Gladiolus*, &c., lifting and storing the corms and runners in light soil for the winter. Where it is hardy it soon becomes established, and covers a large area. The leaves are grassy and the flower-spikes a foot or more high, bearing numerous spreading orange-yellow flowers. A variety called *maculata* or *imperialis* has large flowers blotched with dark-brown. Native of South Africa.



Fig. 467.—*Tropæolum speciosum*.

of a pretty pinkish shade. Propagated by seeds. Native of Europe.

Veratrum.—Large-leaved plants of the Lily order, with poisonous roots. They grow well in good rich soil, and are worth a place in the hardy-plant border. The flowers are produced on tall spicate panicles, which are very effective. Increased by division or seeds.

- V. album*. White, 8 feet. Europe.
V. nigrum. Black-purple, 5 feet. Europe.
V. viride. Greenish, 8 feet. North America.

Verbascum.—Ornamental plants of noble aspect, suitable for isolated beds, or grouping in wild garden or shrubbery. Their flowers are chiefly yellow or creamy-white, and are produced on massive spikes 2 to 8 feet high. The large leaves form immense rosettes, and are often very downy; even without the flowers they form very striking objects. Propagation by seeds. Some of them die after flowering.

- V. Chaizii*. Small, yellow, 4 feet. South-west Europe.
V. nigrum. Yellow, 8 feet. Europe (Britain).
V. olympicum. Yellow, 6 to 8 feet. South Europe.
V. pannorum. Sulphur-yellow, 6 feet. Macedonia.
V. phaniceum. Purple, 8 feet. Europe (Britain).

Veronica (Speedwell).—A useful genus in the garden. The majority of the species are shrubby, but the following are herbaceous, effective plants for the border and

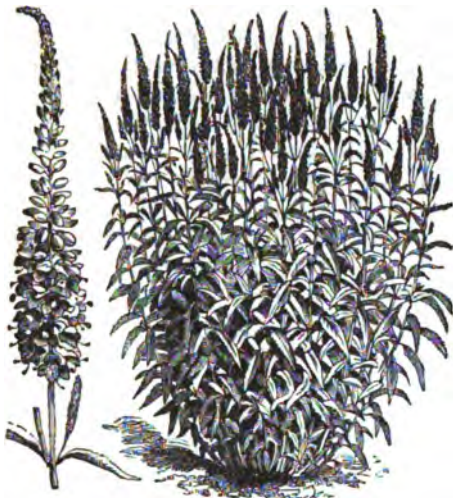


Fig. 468.—*Veronica spicata*.

rockery. They grow well and flower freely in ordinary soil. Propagated by division or seeds.

- V. gentianoides*. Blue, 1 to 1½ foot. South-east Europe.
- V. incana*. Violet, foliage silvery-gray, 6 inches. South Russia.
- V. longifolia*, var. *subsessilis*. Deep-blue, 2 feet. Japan.
- V. spicata* (fig. 468). Blue, 1 foot. Europe (Britain).
- V. Teucrium*, var. *dubia*. Deep-blue, prostrate.
- V. virginica*, var. *alba*. White, 4 to 5 feet. North America.

Viola.—Includes many charming plants suitable for rockery or border. Some of the smallest in stature have the largest flowers, and their colours range from white through shades of lilac and blue to violet. There are also several species with yellow flowers. They prefer a rich, loamy soil with plenty of grit and sand. *V. pedata*, the Bird's Foot Violet, grows in a very gritty, stony medium, and likes plenty of water. Increased by division and seeds.

- V. biflora*. Yellow, 8 inches. Europe.
- V. calcarata*. Pale-mauve, 8 inches. Europe.
- V. cornuta*. Pale-violet, 6 inches. Pyrenees.
- V. cucullata*, var. *alba*. White, 6 inches. North America.
- V. munbyana*. Pale-violet, 6 inches. Spain.
- V. odorata*. White, 8 inches. Europe (Britain).
- V. pedata*. Mauve and purple, 8 inches. North America.
- „ var. *bicolor*. Mauve and deep-violet, 8 inches. North America.

See also special chapter on *Violas* and *Violets*.

Wahlenbergia.—Related to *Campanula*, from which it differs only in the manner in which the seed-capsule dehisces. The following are neat rock plants of dwarf habit, with grass-like leaves covered with short hairs. The flowers are lilac-blue and deep-purple. A light soil and a sunny position suit them best. Propagation by seeds.

- W. dalmatica*. Purple, 8 to 4 inches. Dalmatia.
- W. graminifolia*. Violet-purple, 4 inches. Italy.
- W. Pumilio*. Violet, silvery foliage, 2 inches. Dalmatia.
- W. serpyllifolia*. Deep-purple, 8 inches. Dalmatia.
- W. tenuifolia*. Violet, 4 inches. Dalmatia.

Waldsteinia fragarioides has glossy-green leaves like a strawberry, resembling that plant also in habit. Its

pretty bright-yellow flowers are borne in May and June. A useful plant for clothing banks which it is desirous to hide, and it succeeds in any garden soil. Propagated by division or seeds. Native of North America.

Wulfenia.—A small genus of showy plants with lovely blue flowers, allied to *Scrophularia*. They grow best in a shady position and a light, rich, loamy soil, either in the rockery or border. Propagated by seeds. Both species are rather rare, *W. carinthiaca* being the older and commoner of the two.

W. Amherstiana. Blue, 1 foot. Himalaya.

W. carinthiaca. Purplish-blue, 12 to 18 inches. Carinthia.

Xerophyllum asphodeloides (Turkey's Beard).—The leaves of this plant form a spreading grassy tuft, from the centre of which the flower-stems rise from 1 to 4 feet in height, and terminate in a raceme of many white blossoms. It grows best treated as a semi-aquatic. Propagated by seeds and division. Native of North America.

Zauschneria californica (fig. 469) is a handsome late summer-flowering perennial. It grows to a height of about 18 inches, and produces spikes of bright vermilion-coloured tubular drooping flowers after the style of a *Fuchsia*. Sandy loam suits it best, and slight protection in winter is needed on cold, clayey soils and in exposed



Fig. 469.—*Zauschneria californica*.

positions. Suitable for rockery or border. Propagation by division in spring.

Zephyranthes.—A genus of mostly tender bulbous plants, belonging to *Amaryllidaceae*. A few of the species

are hardy, and make pretty plants for the bulb garden or for edging purposes. The flowers are solitary and Crocus-like, appearing in summer. The tenderer species may be grown outside also, if lifted in the autumn and stored



Fig. 470.—*Zephyranthes candida*.

along with *Gladiolus*, &c. In the south *Z. candida* is an excellent substitute for *Box* as an edging to borders. A sandy soil and full sun suit them. Increased by offsets.

Z. Atamasco. White, tinged rose, 6 to 9 inches. Virginia.

Z. candida (fig. 470). White, 4 to 8 inches. Buenos Ayres.

CHAPTER XXV.

AQUATIC AND BOG PLANTS.

The cultivation of aquatic and marsh-loving or "bog plants" has advanced considerably during recent years, and no garden of any pretensions can be considered complete without water and marshy bits of land in which to grow them. Even in places where ample areas of water exist they are too often bare and uninteresting, or not planted with that tasteful variety of vegetation now readily obtainable for the purpose.

It is by no means recommended that collections of all aquatic, or marsh, or bog plants be

planted, but rather that the best and most effective of them should be tastefully employed for picturesque effect.

Above all, the effects should be natural, and as simple as may be, the point to aim at being not merely economy in the making of any part of a garden, but to so form and arrange it that it may be cheaply kept afterwards. If rocks are used, they should be so arranged that suitable plants may be grown about them; vulgar shams, or imitation rustic bridges and similar artifices, should be avoided. Rustic work, so called, is generally expensive and bad. Even the mounding-up of earth near water, as frequently recommended, is often quite unnecessary, groups of small trees or shrubs being a more simple and economical means of obtaining the same end—viz. preventing the whole surface of a pond or lake being seen at once from particular points of view.

Of all suitable trees for the water-side none are finer than Willows, the common White Willow being one of the best. In mild southern localities *Salix babylonica* often forms a charming addition to a pond or stream side, as may be seen on the Thames from Kew to Hampton Court. For large lakes or the banks of rivers, stretches of Golden and Cardinal Osiers, and Crimson Dogwood, with here and there a clustered group of Silver Birch, give life and colour to the scene. The Osiers and Dogwood may, if necessary, be kept at a moderate height by pollarding as required.

In the case of small gardens the water-garden may be limited to cement tanks of any shape conformable to the situation. These need not be above 18 inches or 2 feet in depth, and may have rocky or marshy margins as may be most desirable. Or even a few shallow tubs may be sunk here and there in snug, sheltered spots, near a supply of water, for the growth of *Nymphæa*, *Aponogeton*, *Richardia*, and other things. A friend who visited M. Marliac's garden at Temple-sur-Lot, in France, wherein the first coloured hybrid Water-Lilies were raised, found shallow cement-tanks and tubs largely employed for their culture, just as the late Rev. H. Ellacombe, of Clyst St. George, used them many years ago when aquatic plants had not attained the popularity they enjoy to-day.

Nymphæas and most other water plants grow best in soft water and full sunshine, but above all things they must have shelter from high winds. Water-Lilies especially look very uncomfortable, and refuse to open well, on windy days. Another point is, that the more tender

kinds thrive best in shallow tanks or pools of clear, still (not running) water, because, when exposed to full sunshine it becomes naturally heated to its fullest extent, running water being much cooler. Wherever warm springs exist naturally and can be led into shallow tanks or



Fig. 471.—Pond for Aquatics at Enys, Cornwall.

pools, the best results might be obtained. In a few cases open-air tanks have been heated artificially by hot-water pipes, and not only tropical Nymphæas, but even the *Victoria regia*, *Euryale ferox*, and other stove aquatics have been flowered in them.



Fig. 472.—Stream Garden.

The brook or stream side may be beautified and filled with interest by clothing it with suitable vegetation, as, for instance, the Fern-fringed streamlet shown at fig. 472.

As to soil, good loam enriched with cow manure, or pond mud, form the best compost, and may be covered with a thin layer of gravel so as to keep the water clear. Nymphæas especially require ample room, and should be kept

clear of weeds. Water-fowl, rats, and voles often do much damage, as also does the caddis-worm. With the advent of the French and American hybrid and seedling Nymphæas a new and brilliant era of aquatic gardening has opened up within the last decade; and the wonder is that more attention is not given to aquatic plants in the London parks.

At Kew, Gunnersbury House, at Gravetye

Manor and at Wisley, at Glasnevin and at Carton, County Kildare, tropical colour and luxuriance are imparted to the pools and lakes by the best of the new Water-Lilies. Even the *Nelumbiums* may yet be found amenable to open-air culture in warm and sheltered court-yards by using shallow tanks or tubs of water exposed to fullest sunshine.

Cyperus Papyrus, *Nymphaea stellata*, *N. devoniana*,

and others cultivated in pots have already been grown successfully out-of-doors in England during the summer months, receiving shelter during winter and early spring. There is yet ample room for ingenuity and invention in aquatic-plant culture by amateurs and others, and no ornamental plants will repay intelligence and skilful culture better than the new coloured *Nymphæas*.



Fig. 472.—Corner of *Nymphaea* Pond, Glasnevin.

Planting.—*Nymphæas* and plants of similar character may be planted in shallow baskets or flat wicker hampers of clayey loam or pond mud, or in loam and cow-dung, and sunk into their places in pond or tank. Near the margins of ponds, &c., where the water is shallow, the baskets can often be slid down planks supported at one end on the bank; but in the case of large lakes, &c., a punt or raft must be used, not only in the planting but also for cutting weeds, gathering flowers, &c., during the summer season. When there is a foot or more of rich mud at the bottom of ponds, the rhizomes of aquatics—*Nymphæas*, &c.—may be tied to a large stone and sunk without further trouble.

We have added lists of—I, aquatics proper, *i.e.* such as grow absolutely in or on the water, and II, of marsh and bog plants for wet soil at the water-side.

I. HARDY AND HALF-HARDY AQUATIC PLANTS

It is not easy to speak definitely as to the thermal limits of aquatic plants, but so far as their resistance to cold goes it is largely dependent on the heat of summer. For example, we know that in America many *Nymphæas*, *Nelumbium speciosum*, and *N. luteum* withstand many degrees of frost with impunity, the same species dying with us although our winters are comparatively mild. We may also point out that though shallow water is warmest and best for tender aquatics during summer, the reverse is true in winter, when they are less liable to injury in deep water. Shallow, exposed tanks and small pools filled with the half-hardy kinds should be protected with boards, or poles and mats, during severe frost.

APONOGETON distachyon (Cape Pondweed) (fig. 474), one



NELUMBIUM SPECIOSUM



VICTORIA REGIA

of the prettiest plants for a pond, tank, or stream. It has oblong bright-green leaves and twin flower-spikes, the ivory-white bracts being very conspicuous. It is very fragrant, and blooms nearly all the year. Although quite

LIMNOCHARIS Humboldtii (fig. 475).—Floating rounded leaves of a bright-green colour, and large soft-yellow flowers. One of the most beautiful of all floating aquatic plants. May be readily grown in a tub or small tank, or near the margin of lake or pool, so as to be near the eye.



Fig. 474.—*Aponogeton distachyon*.

hardy in 2 feet of water, it may be grown indoors with advantage during winter in tubs or bowls.

AZOLLA filiculoides.—Pretty little floating plant, turning a charming red colour in sunshine. It is quite hardy in many places, and likes stagnant or muddy water.

BAMBOOS.—Most species of *Arundinaria*, *Thamnocalamus*, and *Bambusa* grow best in deep moist soil near water. They grow in any good soil if well sheltered from wind, but look best beside ponds or streams, or in moist gulleys and ravines. (See p. 291.)

BRASERIA peltata (Water Shield).—Copper-coloured peltate leaves. Flowers purple-brown, of neat habit.

BUTOMUS umbellatus (Flowering Rush).—Forms masses 3-6 feet high near lake margins, rising out of the water with rushy green leaves, and tall umbels of pink flowers.

CABOMBA aquatica.—A feathery, rich, bright-green plant, resembling the floating *Ranunculus*, but requiring sub-tropical warmth.

CALLA palustris (Bog Arum).—Bright-green leaves, not unlike *Pontederia*, and small white Arum-like flowers. Leaves and flowers on long rhizomes.

CYPERUS alternifolius rigidus.—Dark-green sedge, with umbrella-like leaves, narrower than those of the type.

EICHORNEA azurea.—Stems long and rope-like, clothed with upright, spoon-shaped, bright-green leaves, and bearing handsome spikes of rose-lilac flowers, similar to those of the Water Hyacinth, to which it is allied. Sub-tropical.

HEDYCHUM.—All the species grow and flower with freedom when treated as semi-aquatics, i.e. growing them in large pots partly sunk in a warm-water tank.

HOTTONIA palustris (Water Violet).—Finely-cut submerged foliage of a dark, bright-green, flower-spikes verticillate, with pinkish flowers not unlike those of *Primula japonica*.

JUSSIEA grandiflora.—A free-growing plant, not quite hardy, but worth growing for summer effect. Its long rhizomes creep along the surface of the water, and put out curious pith-like floating roots. The leaves are fresh-green, amongst which appear the golden *Oenothera*-like flowers.

MENYANTHES trifoliata (Bog-Bean).—A pretty native plant, with ternate leaves and spikes of pink-and-white hairy fringed flowers.

MYRIOPHYLLUM proserpinacoides (Green Feather).—A fresh-green plant, well adapted for carpeting mud or shallow water, or for fringing tanks and vases during summer.

NELUMBIUM luteum (the Yellow Lotus).—This species is found in Jamaica and in the southern United States, and although tolerably hardy it is not often successfully grown. In habit it is similar to *N. speciosum*, but not so robust, and the flowers are of a soft and pale-yellow colour.

N. speciosum (see Plate).—One of the most exquisitely beautiful of all water plants, which is largely grown in tropical countries,

India, China, and Japan. Flowers 6-12 inches across and very fragrant, borne on stalks 3-6 feet high. Leaves peltate, soft-glaucous hued, and velvety, so that water trickles off them like quicksilver, and as the rounded leaves are borne on tall slender stalks they look like sunshades or umbrellas. As a rule they rarely thrive except in a warm plant-house, but in France and the northern United States they bloom during the heat of summer in outdoor tanks in enclosed and sheltered conditions. Their rhizomes enjoy creeping in hot slimy mud enriched with manure. The following are Japanese varieties said to be hardier than the type:—



Fig. 475.—*Limnocharis Humboldtii*.

- Album fl. pl.*—Flowers double, pure white.
- Album striatum*.—Flowers white, margined and streaked with crimson.
- Grandiflorum album*.—Flowers very large and of the purest white.
- Kermesinum*.—Flowers deep rosy-carmine.
- Oeiris*.—Flowers very large, rosy-crimson.
- Pekinense rubrum*.—Flowers large, of a rich, reddish-purple colour.
- Roseum fl. pl.*—Flowers very full, double, pale-rosy.

NUPHAR advenum.—A very robust grower. Leaves rich-green, above the water. Flowers large, globular, yellow, red inside.

N. Kalmianum. Neat and small, with light-green erect leaves and small globular golden flowers.

N. luteum.—Common yellow "Brandy Bottle", but too coarse for small sheets of water. Flowers globular, yellow—like gold-headed drum-sticks. Var. *minor* is a smaller form.

N. sagittifolium.—A rare and distinct plant, with arrow-shaped leaves and pale-yellow flowers.

NYMPHÆA alba (common White Water-Lily) (fig. 476).—Wild throughout the British islands, and somewhat

N. gigantea (Australian Blue).—A beautiful stove species, with numerous blue petals and a golden centre, and 6-8 inches in diameter.

N. Gladstonii (fig. 477).—Flowers white, 8 inches across, cupped. One of the best. Very fragrant. An American seedling.

N. gloriosa.—One of the best and most brilliant of all garden hybrids. Colour intense crimson-carmine, with a purple shade.

N. James Gurney.—Flower 6 inches across, petals long and crepe-like in texture, opening pink, and deepening in colour each successive day. Like *N. Wm. Falconer*, the flowers open early and remain so all day. American seedling.

N. Leydekeri.—The type of a series of small-growing kinds raised by Mariac. Flowers opening pale-rose, becoming deeper the second and third day. All the race are presumably seedlings from *N. pygmaea* fertilized by some red variety.

Var. *fulgens*.—Flowers rich crimson with an orange centre.

Var. *lilacea*.—Flowers pale rosy-lilac.

Var. *purpurata*.—Rich and deep rose-crimson, or carmine, with orange stamens.

Var. *rosea*.—A free-grower, with pale-pink flowers, deepening in tint each successive day.

N. Lotus (Egyptian Lotus).—Large red or white flowers; sepals with red margins. A very beautiful stove species, and the sacred Lotus of the ancient Egyptians. It is often represented on old coins, and monuments, tombs, &c. Its fruits and rhizomes were used as food. Var. *dentata* is a white form with flowers 6-15 inches in diameter, and comes from Sierra Leone. There are several other named varieties.

N. lucida.—Flowers very large and solid, of a vermillion-red colour.

N. Mariacea-albida.—One of the largest and best of the white *Nymphæas*. All the *Mariacea* group of



Fig. 476.—*Nymphaea alba*.

variable: one of the best vars. is *plenissima*—flowers nearly perfectly double.

Var. *candidissima* (Giant White Water-Lily).—One of the best and strongest growing of all the white kinds.

Var. *rosea* (Rosy Swedish Water-Lily).—A rare and beautiful rose-pink form of above. Also known as *N. Caspary*.

N. amazonum.—Fragrant yellowish-white flowers 3-4 inches across, a greenhouse or stove species. Leaves entire or smooth-margined.

N. ampla speciosa.—A yellowish-white stove species from Jamaica.

N. aurora.—Flowers shapely, of a light-rose colour, with golden anthers.

N. caroliniana.—Medium-sized; flowers salmon, rose, or flesh-colour; fragrant.

N. devoniensis.—Flowers bright-rose or red, 5-8 inches across, flowering from March till November in a warm tank. It is a hybrid raised at Chatsworth.

N. elegans.—Sweet-scented, as large as *N. alba*; sepals pale-green or yellowish, streaked with brown; petals 10-15, yellowish-white shaded with purplish-blue or lilac. Stove. New Mexico.

N. Ellisiana.—Flowers medium size, intense crimson or carmine-purple.

N. flava.—A small-growing Floridan species, rather shy in flowering; canary-yellow.

N. Frabelli.—A hybrid, with medium-sized, deep crimson-purple flowers; sweet-scented. It is quite hardy, and is a robust grower.

N. fulva.—Flowers light-yellow suffused with dull-red.



Fig. 477.—*Nymphaea Gladstonii*.

hybrids are robust, and throw up their central leaves above the surface of the water, and unless divided and replanted every three or four years the flowers are hidden by the leaves. They appear to be seedlings of *N. candidissima* crossed with *N. odorata-rosea* or *N. alba-rosea*.

N. Mariacea-carmea.—One of the best. Flowers 6-8 inches across, of a delicate rose or flesh colour. Vigorous grower.

N. Marliacea-chromatella (fig. 478).—Soft canary-yellow flowers, 4-6 inches across, with orange stamens. Very free in growth and flowers.



Fig. 478.—*Nymphaea Marliacea-chromatella*.

N. Marliacea-flammea.—Rich crimson-purple, suffused with white or lilac.

N. Marliacea-ignea.—A moderate grower, but one of the deepest and richest in colour. Rich glowing crimson, with orange centre.

N. Marliacea-sanguinea.—Bright reddish-crimson.

N. nivea.—White flowers; fragrant.

N. odorata.—The Sweet-scented Water-Lily of North America, with shapely white flowers, smaller than those of *N. alba*. In the hands of M. Marliac it has given rise to a very beautiful series of varied forms, having shapely incurved flowers and blunt or spoon-shaped petals. They are all suitable for small tanks, or the margins of shallow ponds. The flowers close early in the afternoon.

Var. *exquisita*.—Soft rosy-carmine flowers.

Var. *minor* or *pumila*.—Small, with white flowers.

Var. *rosea*.—Flowers larger than the type, elegantly cup-shaped, clear soft rose-pink.

Var. *rubra*.—Flowers dark-rose.

Var. *sulphurea*.—Similar to *N. M.-chromatella*, but flowers deeper yellow, with more pointed petals; fragrant.

Var. *grandiflora*.—Stronger and larger than the last. Flowers 5-7 inches across, with petals like a Cactus Dahlia. Colour clear yellow, with orange centre.

The preceding two kinds have large brown-marbled leaves, and are quite different to the other forms of *N. odorata*.

N. pygmaea.—The very smallest of its race, the leaves being only 2 or 3 inches wide, and the flowers less. The latter are peculiar in having the segments arranged squarely, hence the synonym *N. tetragona*.

Var. *helvola*.—Similar in habit to the last, but having bronzy-marbled leaves and soft canary-yellow flowers. Both are suitable for small aquaria.

N. Richardsonsii (fig. 479).—Similar in habit to *N. tuberosa*. Flowers pure white, standing well above the water, the sepals and outer petals drooping so that they form a perfect globe.

N. Robinsonii.—A Marliac seedling of a soft-red shaded with buff or yellow, and of medium vigour.

N. soutifolia.—A South African plant with sweet-scented blue flowers. Differs from *N. stellata* in having broader blunter petals. Stove, or warm water.

N. Seignouretii.—Pale-yellow, shaded or flushed with carmine.

N. stellata (Starry Blue).—This is the common African species. It may be wintered in warmth, and placed in a sunny tank in May or June in the open air. Var. *cyanea* is a pale-blue form from India. A long-stalked larger pale form is known as the "Berlin variety", and var. *versicolor* is white flushed with red. *N. stellata* is often misnamed *N. caerulea*. Var. *zanzibarensis* is the largest and best form, the flowers being coloured rich purple-blue, and often measuring 7 inches across. There are paler smaller forms of it.

N. Sturtevantii.—An American seedling from *N. devoniensis*, bearing very large and shapely flowers of a pale, clear, rosy-red colour.

N. thermalis.—Leaves sharply toothed. Flowers pure white, with a vinous odour. Stove or warm tank, being found in the warm river Pecze, hence its specific name.

N. tuberosa.—A free-growing North American species, with ample foliage and large white flowers, produced later than those of *N. alba*. Similar in habit to *N. candidissima*, but the root-stock is creeping, bearing oblong tubers.

N. Wm. Doogue.—Flowers 5-6 inches in diameter, cup-shaped, and of a clear shell-pink colour; petals very broad and of great substance. An American seedling.

N. Wm. Falconer.—One of the largest and best. Flower 6 inches in diameter, garnet or ruby crimson, with orange-yellow anthers. Being intermediate between *N. Leydekeri* and *N. Marliacea*, it grows well, but is not too robust. Leaves red when young, turning to olive-green with red veins. An American seedling.

PELTANDRA virginica.—The "Arrow Arum" of the N.E. American woods, which may be grown in a sunny sheltered pool, though it is not very showy.

PISTIA stratiotes (Water Lettuce).—A floating plant with thick-ribbed, soft, light-green leaves. Subtropical,



Fig. 479.—*Nymphaea Richardsonsii*.

but may be grown outside in sheltered tanks or vases during summer.

PONTEDERIA cordata (Pickerel Weed).—Forms tall tufts of heart-shaped leaves and blue flowers on slender stems.

P. crassipes (the Water Hyacinth) (fig. 480).—A floating tufted plant with inflated leaf-stalks, reniform leaves, and spikes of rose-purple Hyacinth-like flowers. It thrives in a sunny pool out of doors in summer, and multiplies rapidly.

RANUNCULUS Lingua (Largest Water Buttercup).—A free and tall-growing plant 3-6 feet high, with narrow

glaucous, lance-shaped leaves, and yellow flowers 2 inches across. A beautiful plant for pond or lake margins.

SAGITTARIA gracilis.—All the "Arrow Heads" are quaint and handsome, this being of slender habit, with small white flowers. They do best in mud.

S. japonica *f. pl.*—One of the best, producing spikes of full double stock-like pure-white flowers. Leaves light-green and handsome.

S. montevidensis.—A giant, attaining a height of 5-6 feet when well grown. Leaves large and handsome, light-



Fig. 480.—*Pontederia crassipes*.

green. Flowers in whorls on tall spikes, white and maroon.

S. sagittifolia.—A pretty native plant with pure-white flowers.

S. variabilis.—Forms dense masses of bright-green leaves and spikes of milk-white flowers. In 2 feet of water on rich muddy bottom this plant spreads rapidly, and soon covers a large area.

SALVINIA natans.—A pretty little floating cryptogam, with two-ranked pale-green leaves rough on the surface. What appear to be roots are the veins of a third row of leaves that take on root functions. Very interesting for pans, bowls, or small aquaria.

SCIRPUS lacustris (Bulrush).—May be used in large lakes with good effect, either alone or along with *Typha* and *Butomus*.

STRATIOTES aloides (Water Soldier).—Rosettes of purplish-green serrated linear leaves below the surface of the water. Flowers small, pure white. An interesting and distinct native plant.

THALIA dealbata.—A tall tufted plant with glaucous foliage on long stalks, resembling a *Maranta* in habit, and bearing long spikes of purple flowers. Not quite hardy generally, but useful and effective for lake margins in summer.

TRAPA natans (Water Caltrops).—A pretty annual plant, growing and seeding freely in warm water. Leaves glossy, undulate, rhomboidal, on swollen green petioles which act as floats. Flowers greenish-white. Var. *verbanensis* has glowing-red petioles. The leaves colour beautifully in autumn.

TRIANEA bogotensis (Sponge Leaf).—This floating plant reminds one of a gigantic *Lemna* or "Duck-weed", and may be grown in a bowl of mud and gravel surfaced with water in the greenhouse, or thrown on a tank or pool. It grows well out-of-doors during summer. Its flat green leaves are roundish heart-shaped, and are bulged out

below by a system of air-cells which enable them to float.

TYPHA angustifolia.—A tall and slender form of "Mace Reed". Its brown leaves and stems and chocolate-coloured heads are very effective on shallow margins of ponds or streams in winter.

T. latifolia (Reed Mace).—Well-known native plant of the fens and rivers; grows 8-10 feet high, with broad glaucous leaves and great ramrod-like black heads. Very effective along pond or lake margins, or back-waters.

T. minima (Round-headed Mace Reed).—This is a rare little plant growing 12-18 inches in height, and is useful for small tanks or aquaria.

T. minor (Smaller Reed Mace).—Apparently a small form of *T. angustifolia*, growing 2-3 feet high only.

VALLISNERIA spiralis (Tape Grass).—A dioecious plant with linear floating leaves and greenish-white female flowers on long spirally-twisted thread-like stalks. The male plant is smaller, with more slender leaves, and the flowers break off and rise to the surface of the water, where the pollen floats in the shape of a white powder. Easily grown in mud and sand in a bell-glass.

VICTORIA regia (see Plate).—The finest of all water plants, both leafage and flower being alike superb. Although usually grown as a stove annual, it has been grown in a tank of water heated to about 75° in the open air in Mr. Joseph Mayer's garden at Bebington, Cheshire, where it flowered splendidly, no glass or other protective covering being used. Messrs. Weeks also grew the plant very successfully in a tank in a court-yard at Chelsea, but a cover was used. In America the *Victoria* has been flowered successfully in open water, but their summers are usually hotter and more equable than ours. A form of it known as *Tricker's variety*, with broad turned-up leaf-margins and of sturdy growth, is said to be at least ten degrees hardier than the type. When grown under glass a tank at least 40 ft. square and water at a temperature not lower than 70° are requisite.

VILLARSIA nymphaeoides (*Limnanthemum*).—A free-growing native plant like a small *Nymphaea* in habit, having bronzy marked floating leaves and golden-yellow ternate flowers. Grows well, and spreads rapidly either in deep or shallow pools.

II.—HARDY AND HALF-HARDY MARSH OR BOG PLANTS

Although some of these are really amphibious, they, as a rule, grow best in the soil of the banks and margins of pools and lakes, positions from which they can send roots down to or into the water; or to which at times the water itself may actually rise. In planting pond or stream margins, due allowance must be made for occasional overflow and floods. Some idea of the character of a bog garden may be obtained from fig. 481.

ACORUS Calamus (Sweet Flag).—Green, Iris-like foliage, daintily crimped along one margin only. Root-stock and leaves odorous.

A. graminifolius.—Dwarf, tufted habit, with leathery, grassy leaves. There is a variegated form of it.

A. japonicus variegatus.—Young foliage white-and-red striped.

ALISMA natans.—A floating plant with white flowers. *A. Plantago* is a graceful plant, and may also be grown.

ARUNDO conspicua is a noble grass for the water-side, flowering two months before the Pampas Grass.

A. Donax (The Great Reed).—A very robust and handsome grass, growing 5–20 feet high, and rivalling a Bamboo in grace and beauty; easily grown in deep soils. There are golden and silver variegated forms, and also a larger form known as *maxima*.

CALTHA palustris (Water Buttercup).—Suitable for lake or pond margins, or for massing in marshy places;

no native plant surpassing it in spring when in flower. There are several double-flowered forms of it.

CARDAMINE pratensis *f. pl.*—Very pretty lilac flowers, useful for massing in damp places.

CORTADERIA (*Gynerium*).—The Pampas Grasses, *C. argentea* and *C. jubata* (fig. 482), grouped or massed near to lake margins, are highly effective.

CYPERUS longus.—A stately and vigorous-growing Sedge, for water margins or for cover on islands.

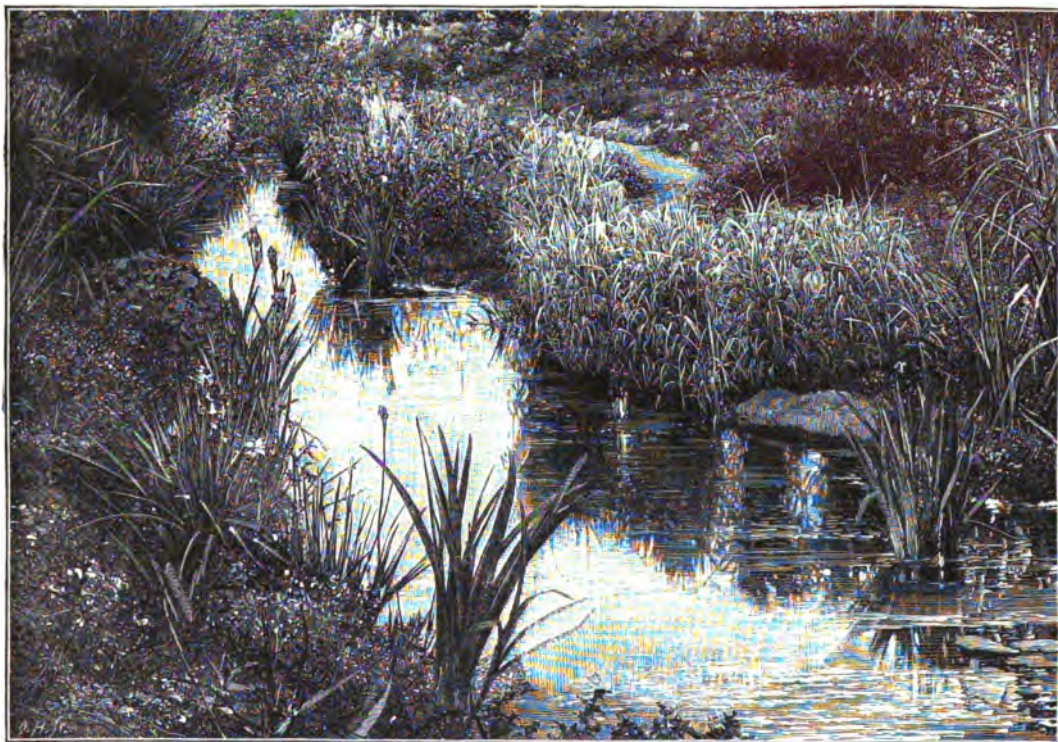


Fig. 481.—Bog Garden.

Various kinds of Sedges, such as *C. asperus*, *C. lucidus*, *C. pungens*, *C. vegetus*, and *C. laxus*, may be used round lake and large pond margins, &c.

C. Papyrus (Egyptian Paper Reed) is very handsome as grown in pots and tubs, and dropped out into sheltered pools and tanks in May or June. It adds quite a tropical character to water vegetation.

DROSEREA.—The native "Sundews" are easily grown on a carpet of living sphagnum in boggy or wet places in full sunshine.

EQUISETUM Telmateia.—Our largest native "Horsetail" grows 3 to 6 feet high in wet soil. *E. Drummondii* and *E. sylvatica* and others are pretty in suitable places, but unless restricted all are apt to run wild and become weedy.

ERIOPHORUM polystachyon (Cotton Grass).—A slender bog grass, with silvery tufts on gracefully thin stipes. Common on Irish bogs, and has been called the "Irish Edelweiss". It grows best in wet peat.

FERNS.—Many Ferns do well along water margins, such as *Osmunda* (which see), *Struthiopteris*, *Athyrium*, and *Scolopendrium*. For damp walls and water-courses the latter are especially appropriate. In very warm

and sheltered nooks with shade *Lomaria magellanica* and *Woodwardia radicans* grow well and are very effective.

GUNNERA manicata.—The largest and most effective of all foliage plants for the water-side. Leaves 5–10 feet across, and 10 feet high in favourable situations. Does best in deep rich soil near water. Its leaves get torn by high winds.

G. scabra.—Similar to the last, but smaller, and will grow better in dry places than *G. manicata*.

G. insignis, with red leaf-stalks and veins, and *G. peltata*, should also be tried.

HOUTTUYNIA cordata.—A Japanese herb with purplish-red leaves and terminal white flowers. Very pretty; smells disagreeably when bruised.

IRIS laevigata (*Kämpferi*) (Japanese Water Iris) (fig. 483).—Largely grown in the gardens of Japan, and a plant of such infinite variety and beauty that wherever they grow well they should be planted largely. There are varieties of all colours—white, rose, peach, crimson, purple, and blue. They thrive in deep, rich, peaty soil, with plenty of moisture when growing.

I. Pseudo-Acorus.—The common yellow Iris is well

known, and is very handsome in suitable positions. A variegated variety of it should also be used.

JUNCUS spiralis (Corkscrew Rush).—A curiosity, the

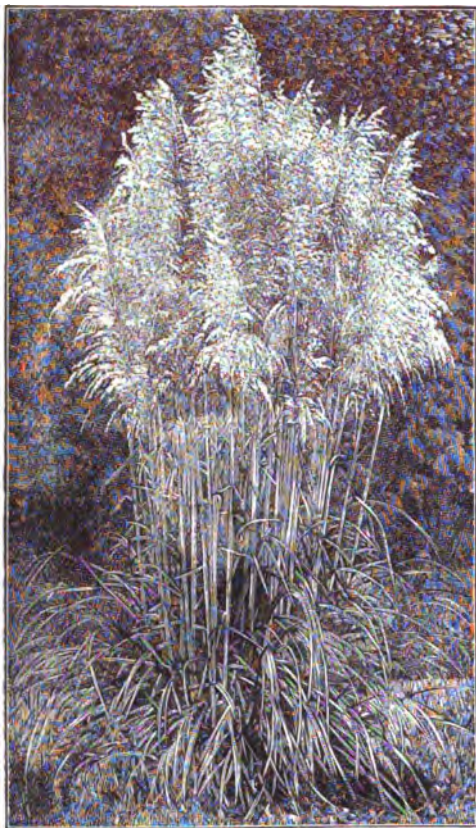


Fig. 482.—*Cortaderia jubata*.

stems growing in spiral coils instead of straight and erect as in the type, *J. effusus*.

J. zebrinus (*Scirpus Tabernamontani*) (Porcupine Quill Rush) is very handsome as grown in pots or tubs, and sunk in a foot or so of water. Stems banded with yellowish-white, apt to run green if planted out on a rich bottom.

LILIUM.—Several of the North American Lilies, such as *L. superbum*, *L. canadense*, *L. pardalium*, &c., are never so luxuriant and happy as when in peaty places near water-level. Even the beautiful *L. giganteum* does best in a peat bed, and enjoys ample moisture.

LOBELIA cardinalis.—This old favourite and its varieties are beautiful as grown in wet beds or borders in peat or loam and leaf-mould. They look particularly effective near water.

MYOSOTIS palustris.—The Marsh Forget-me-not is lovely on mud-flats or lake margins, and may be used along with Reed Mace or the Great Buttercup with good effect. *Iris laevigata* carpeted with it make a charming group.

MYRTICA Gale (Bog Myrtle).—A low-growing sweet-scented native shrub, well worth planting in wet peaty and heathy places.

NARTHECIUM ossifragum (Bog Asphodel).—Not unlike a dwarf yellow Iris or Sisyrinchium, and its rich orange-red colour in the autumn is very effective when seen in broad masses.

ORCHIDS.—Some of the terrestrial Orchids do well in low moist peat beds, near water, such as *Orchis latifolia*, *O. foliosa*, and *O. maculata*. *Habenaria* and *Epipactis* also do well. The bog Cypripedes are *spectabile* (fig. 484), *pubescens*, and *parviflorum*.

OBONTIUM aquaticum.—Has velvety blue-green leaves and yellow clubs or spikes.

OSMUNDA regalis (Royal Fern).—Of all our native Ferns none is more ornate than this species at all seasons of the year. It deserves planting in quantity beside ponds or rivulets, doing well on turfy banks or in deep wet places amongst stones and rocks, where its black fibres can run down to the water below. The young fronds are of a soft and tender green, or olive-green in the red-stemmed forms, and they die off a lovely rich red-brown or fox colour in autumn, the dead fronds remaining on the fibrous stems all through the winter. The exotic *O. cinnamomea*, *O. palustris*, and *O. gracilis* may also be grown.

PARNASSIA palustris (Grass of Parnassus).—A pretty little upland weed, easily raised from seed sown on wet peat and sphagnum moss. Its white-green veined flowers are both curious and beautiful.

POLYGONUM sachalinense.—In deep, rich, moist soil near water this plant grows 10–15 feet high, its jointed hollow stems bearing large flat leaves and clusters of white flowers. The brown stems produce a cheerful effect in wintry sunshine. Several other species may also be used in the same way.



Fig. 483.—*Iris laevigata* (Kempferi).

PRIMULA.—Nearly all the Primroses grow well in boggy places, and this is especially true of *P. rosea*, *P. sikkimensis*, and the forms of *P. japonica*, which are never so

happy as when beside streams that now and then overflow.

RICHARDIA ethiopica.—This plant grows well either in a dry border or in shallow or even deep water with its



Fig. 484.—*Cypripedium spectabile*.

roots and stems entirely submerged. In Cornwall and S. and W. Ireland it grows and flowers freely in the open air, and watery places are profitably utilized to grow the white spathes by the thousand for the English flower market.

ROGERSIA podophylla.—A very striking saxifragaceous plant from Japan. Its large five-parted leaves open a rich bronze colour; it also bears tall feathery spikes of Meadow-Sweet-like flowers 3-4 feet in height.

SARRACENIA purpurea.—All the *Sarracenia*s are hardy in sheltered places, but this is one of the best for growing in the open air, where its curious pitchers colour well. It does well in peat and living sphagnum moss. Its ally, *Darlingtonia californica*, does well here and there in favourable situations.

SAXIFRAGA Fortunei.—A distinct white-flowered kind with dark rounded leaves. Does best amongst wet stones in a half-shady spot.

S. peltata.—This is very handsome as seen growing on wet rocks or damp promontories near water-level. Its peltate leaves are often 2 feet across on stalks 3-5 feet long. It bears naked spikes of rosy flowers in spring, and its foliage colours well in the autumn.

SPIRÆA.—Nearly all the herbaceous kinds grow well near water, of which habit our native "Meadow Sweet", both single and double flowered, is an example.

S. palmata (fig. 485), with deep rosy flowers, *S. elegans*, *S. gigantea*, and others, never grow or look so much at home as when planted near water.

SYMPLOCARPUS foetidus (Skunk Flower).—An Arum with large leaves suggesting those of *Lilium giganteum*. May be naturalized in damp woods, &c.

TROLLIUS (Globe Flower).—The native *T. europæus* is at home by the side of a stream or near the margin of a lake, and is effective for several months in summer when bearing its large Buttercup-like yellow flowers on stalks a foot or more high. *T. acaulis* and *T. asiaticus* are also good plants for moist situations.

[F. W. B.]

CHAPTER XXVI.

HARDY AND HALF-HARDY ANNUALS.

The question is often asked, What is the meaning of the term annual as applied to the flowers we cultivate? The most convenient and perhaps the most correct answer is, A plant which within a period of twelve months grows from seeds, flowers, and in its turn produces seeds and then dies.

Some plants which are treated in the garden as annuals, are naturally either perennials or biennials. Conditions of cultivation, and the uses to which they are put, determine, however, their term of existence.

Soil.—Annuals should be sown in a light rather than a heavy soil, although such strong-rooting subjects as Sweet Pea, Nasturtium, Lupin, Convolvulus, and others are more at home in a somewhat heavy soil. It should be deeply dug and well pulverized, the roots of many annuals travelling much deeper in the



Fig. 485.—*Spiraea palmata*.

ground than is generally supposed. It should also be rich, in order that there may be a vigorous growth and a fine and continuous display of

bloom. Annuals are frequently starved through being grown in poor, untilled soil, and this poverty of appearance is augmented when the plants are allowed to grow much too thickly, as is frequently the case.

Sowing the Seeds.—The time to sow annuals in the open air is from the middle of March until the end of May, when the soil is warm and quick germination may be looked for. For very small seeds the soil upon which they are sown should be as fine as possible, indeed it is well to have a specially-prepared fine compost for them. A general rule in sowing is to cover the seed grains with some compost to the depth of their diameter, whether they be large or small; and in the case of the smallest seeds, gently pressing the soil about them when sown. But too much stress cannot be laid upon the importance of the operation of sowing.

After Attention.—As the seed-leaves appear above the soil, and if the weather be dry, they should be gently watered overhead with a fine rose watering-pot. Bright sunshine and a dry surface will otherwise destroy many plants. Thinning-out is absolutely necessary in most cases, however careful the sower may have been in distributing the seeds; and this operation is done with the least harm to the remaining plants when the soil is moist. Annuals as a rule are of a much more branching habit than is generally supposed, but when this is prevented by crowding they are cramped and starved. The thinning should be gradual, so that it may be possible to transplant some of the seedlings to other vacant spots.

Staking.—Some of the taller growing annuals need support, which can be easily afforded by placing a few twigs about them. This support tends to increased robustness of growth, with consequent greater profuseness of bloom. Climbing plants, such as Sweet Peas, Convolvulus, Thunbergia, Tropæolum, &c., need something taller as supports, which while helpful to the plants also enhances the orderly appearance of the border on which they are growing.

The soil on which annuals are growing should be kept loose rather than firm, and free from weeds. It should also be regularly and well watered during times of drought; not merely moistening the surface, but drenching the soil.

Annuals are not now so much grown as formerly. This is mainly owing to the greater use of such plants as quick-growing hardy perennials, Begonias, Violas, &c., which now fill flower-beds that were previously occupied by hardy and tender annuals. But they still have their uses, and

being as a rule easily raised from seeds sown in the open air, charming effects can be speedily secured at a moderate outlay. Whilst few of them have a prolonged season of bloom, this may be extended by making several sowings successionally. Some of those that were popular thirty years ago have ceased to be much grown; whilst others, either new introductions or older types greatly improved, afford ample material for choice. Indeed, a garden filled wholly with annuals, if well managed, would be both interesting and enjoyable.

ACROCLINIUM roseum (fig. 486).—One of the prettiest of the "Everlasting" Flowers. It forms shapely tufts about a foot high, and flowers freely and continuously during the summer, the colour of the flowers being bright-pink.



Fig. 486.—*Acroclinium roseum*.

If the flowers are cut when quite fresh and dried in the sun they retain most of their colour, and are useful for indoor decoration in winter. The seeds should be sown in a little heat in March, and the young plants pricked out in a sunny border in May.

ADONIS.—This genus supplies two hardy annuals, viz. *A. aestivalis*, the Flos Adonis of seed catalogues, a somewhat dwarf form, producing reddish-crimson blossoms; and *A. autumnalis*, which, like the foregoing, has the common name of Pheasant's Eye or Red Morocco. The flowers are blood-red with a dark centre.

AGERATUM.—Several useful summer-bedding plants have been derived from *A. mexicanum*, a somewhat tall-growing species, now displaced by varieties of compact, bushy, free-blooming habit. They are treated as annuals, seeds being sown in early spring in a gentle heat, and the plants gradually hardened off for service in the flower-beds. Imperial Dwarf, blue-flowered, and a white variety of the same; Little Dorrit, and a white-blossomed counterpart; *A. nanum luteum*, light-yellow, with others, are the leading sorts. *A. Lassecauxii*, of taller growth, with rose-coloured flowers, is also a useful form.

ALONSOA.—A genus comprising six species, the best of which is *A. Warszewiczii*, of somewhat shrubby growth, and when cultivated in pots and protected it is sub-perennial. It grows to a height of 12 inches, bearing in July attrac-

tive small orange-red flowers from seeds sown in light soil in March. *Albiflora*, white; *linifolia*, scarlet; and *myrtifolia*, bright-red, are also worth growing.

ALYSSUM maritimum.—Sweet Alyssum is a small annual of cushiony habit, bearing in summer and autumn numerous erect crowded umbels of small star-shaped white fragrant flowers. A useful plant for edgings to borders, or to cover the soil in small beds. It is worth a place in the rockery, and we have seen it thriving on old walls. Easily raised from seeds. It is also known as *Kaniga maritima*.

AMARANTUS (Love-lies-bleeding, Princes' Feather).—The several annual species are easily grown and very effective. The popular *A. melancholicus*, if sown on good soil and allowed plenty of room, grows to a height of a yard or more, and produces large tail-like flower-heads, *A. caudatus* and its forms are equally effective. *A. speciosus* (*pyramidalis*) has erect flower-heads. These may be sown in the open border in early spring. There are several others, remarkable for the rich variegation of their leaves, viz. *A. tricolor*, as effective as a Coleus, but requiring to be raised in heat and planted out in May; other forms of it are *bicolor*, *rubra*, *splendens*, and *salicifolius*, also worth growing for their leaves.

ANAGALLIS.—Several charming annuals of garden origin have been obtained from *A. grandiflora* and *A. liniflora*; chief among them are *aerulea*, blue; Eugenie, light-blue and white; Napoleon III, crimson. Seeds can be sown in light soil in a sunny position in the open air.

ARGEMONE.—Two species of this Poppy-like genus—*A. grandiflora*, white, and *A. mexicana*, light-yellow, are worth growing in the herbaceous border, as they are attractive both in leaf and flower. They grow to a height of from 18 inches to 2 feet; and flower continuously in summer. Seeds may be sown in the open ground in March.

ASPERULA azurea setosa, related to the Common Wood-ruff, is very effective when grown in a fairly light, rich soil, attaining a height of 1 foot, and bearing freely pale-blue flowers.

BARTONIA aurea, with its large golden-yellow flowers, is a most showy plant when well treated, growing to a height of about a foot, of bushy habit, and flowering profusely in any good garden soil.

BRACHYCOMA iberidifolia (fig. 487).—The Swan River Daisy, of which there are blue and white varieties. They form charming tufts a foot high, flowering in summer in an open sunny position. The seeds should be sown in a gentle hot-bed, and transplanted to the open in June.

BROWALLIA data.—An elegant, loose-growing plant from Peru, of which there are several improved varieties. They are best treated as biennials, sowing the seeds in July, wintering them in a greenhouse, and planting in the open in early summer. *B. grandiflora*, from Colombia, and *B. Roezli*, from the Rocky Mountains, are also grown from seeds. *B. speciosa major* produces large blue flowers, and is cultivated as a greenhouse biennial for blooming in winter and spring.

CACALIA (*Emilia*) *coccinea* is a pretty Composite, with brilliant orange-crimson flowers borne in clusters on erect stems a foot and a half high, springing from a rosette of ovate, stalked leaves, those on the stems being sessile.

CALANDRINIA.—Annual species of this genus are *C. discolor*, rose and yellow; *C. grandiflora*, pink; *C. Menziesii* (*speciosa*), purple crimson; and the Peruvian *C. umbellata*, which is practically a biennial. Allied to the Portulacacae. It is usual to sow the seeds on somewhat open, sunny spots where they are to flower, as the corollas expand only in bright sunshine, when they are very showy.

CALENDULA officinalis, the Pot Marigold, and its varieties are useful in the flower-garden in summer. The double forms named Le Proust, nankeen; Meteor, yellow striped with pale-lemon; and Prince of Orange, rich orange, are worth a place in any garden. They grow rapidly, and bloom profusely and continuously. As soon as the flowers fade, the heads should be picked off to encourage the production of bloom. There are several single varieties ranging from pale-buff to orange, but the double forms are most effective. *C. pluvialis* (*Dimorphothecca*) (Cape



Fig. 487.—*Brachycoma iberidifolia*.

Marigold) has white and purple flowers resembling those of a Marguerite, and grows 18 inches high.

CALLIRHOE.—Allied to the Mallows. Forms of *C. digitata* and *C. involucrata*, commonly known as Poppy-Mallows, although classed as perennials, are more frequently treated as annuals, seeds being sown in spring in the open, or else in pans and transplanted. They grow and flower best in a light sandy soil.

CALLISTEPHUS chinensis (fig. 488), the China Aster.—This popular garden annual is roughly divided into two sections—the quilled and the flat-petalled. The former, known as the German Aster, has by means of selection been brought to a high state of perfection; the base of the flower has one or two circles of flat ray florets, and a symmetrical central cushion of quilled florets. They are taller and more branched than the flat-petalled forms, and are much esteemed for exhibition purposes; also excellent for cutting. The flat-petalled section is subdivided into Chrysanthemum-flowered, the Victoria, and the Mignon. Select strains of these are handsome, large, and fully double. The Comet group has long ribbon-like florets. The Mignon group is one of the best for cutting purposes. The Crown-flowered Aster is also flat petalled; the distinguishing feature of this group is that the blossoms are two-coloured, a disc of white forming the centre, surrounded by a marginal zone of some bright shade of rose, crimson, purple, &c. What is known as Truffaut's Pæony-flowered Aster has the florets incurved, and when well grown they are almost hemispherical. As high culture is required to produce fine blooms this sort is not so

much grown for the purpose as formerly. There are several dwarf Asters of mixed character which are recommended for massing in beds. The original wild form has recently been introduced from China, and has found



Fig. 468.—*Callistephus chinensis*.

general favour because of its vigorous free habit, and the elegance of its single flower-heads, which are bright mauve-purple with yellow disc. Seeds should be sown in prepared beds in a frame or house, or in pans or boxes, in March and April, in a compost of finely-sifted loam, leaf-mould, and sand, which should be well watered before the seeds are sown. If glass can be laid over the tops of the pans germination is much hastened. Should the surface become dry, water is best administered by placing the pans, &c., in a vessel of water where it can gradually soak to the surface, instead of sprinkling overhead. As soon as the seedlings are large enough, they are pricked into boxes or a prepared bed in a frame, and hardened off for planting in the open ground. Some of the dwarf-growing Bouquet and other Asters are admirably adapted for pot culture, and are employed in this way for the decoration of the greenhouse. Well-tilled and rich soil is indispensable for the production of a fine head of bloom in the open air.

CAMPANULA.—This genus comprises annuals, biennials, and perennials. *C. macrostyla* is a very distinct, comparatively new species, about a foot high, of loose growth, producing large white flowers, with blue reticulations of great beauty. It is, however, not always happy under cultivation. *C. Laflingii*, purple; *C. Lorezi*, purple, are also worth growing.

CENTAUREA.—A large genus of annuals or biennials, the most useful of which is the blue Corn-flower of the fields, *C. Cyanus*, improved by cultivation and selection. In addition to blue there are white, gray, pink, and rose colours, and also a double form. They are tall, and will thrive in any out-of-the-way position. The blue-flowered forms are largely cultivated for cutting purposes. *C. moschata* includes the blue and white Sweet Sultan, and *C.*

naueolens, the Yellow Sultan, all most useful for cutting purposes. They are also serviceable when grown in pots for the conservatory in early summer.

CHRYSANTHEMUM (fig. 469).—The annual species are numerous and very useful. *C. coronarium*, with its numerous large single white, yellow-eyed flowers, erect in habit, and 2½ feet high; the double white and double yellow varieties are of great value for cutting purposes. *C. carinatum* (tricolor) and its several varieties are very handsome and single-flowered. There is a double-flowered strain of this, larger and more varied in colour than the double forms of *coronarium*, but not nearly so symmetrical. *C. multicaule* is a dwarf, single-flowered yellow variety. *C. segetum*, the yellow Corn-flower of the fields, is represented by improved garden forms. *C. viscosum* (*Sibthorpis*) is similar to the last-named in growth and flowers. The seeds of annual Chrysanthemums may be sown in the open air in thoroughly good soil, and the plants thinned out to admit of ample development. Within the last few years a race of single-flowered forms have been ob-



Fig. 469.—*Chrysanthemum*.

tained by crossing the single forms of *coronarium* and *carinatum*.

CLARKIA.—Of the numerous varieties of *C. elegans* and *C. pulchella* that have originated in gardens, those of the former are now but little grown. They comprise tall and dwarf, double and single flowered forms, with white, pink, red, or variegated flowers. Tom Thumb is dwarf and showy, but of short duration, and has flowers in which the segments have become roundish and entire.

CLINTONIA (*Downingia*).—A genus of Californian annuals allied to Campanula. Two species, *C. pulchella*, blue, and *C. elegans*, white to purple, are cultivated both

as border plants and in pots for the conservatory. The seeds are sown in February in a little warmth, and the seedlings intended for the open air are transferred to the



Fig. 490.—*Dianthus chinensis*.

beds in May. In warm situations the seeds may be sown out-of-doors in April. They are useful for front positions on the herbaceous border.

COLLINSIA bicolor is a favourite garden flower, and one of the best; it grows to a height of 1½ foot, and has purple and white flowers. *C. grandiflora*, pink and blue; *C. violacea*, white and violet; and *C. verna*, blue and white, are worth growing. The seeds of the last-named should be sown as soon as ripe. They do well in any good garden soil.

COREOPSIS (Calliopsis) includes some fine showy annuals as well as perennials. *C. bicolor*, with yellow and brown flowers, is the progenitor of most of the varieties grown. They are rather tall growers, reaching a height of 3 feet. *C. Drummondii* is of dwarfer growth, and produces bright-yellow blossoms. *C. grandiflora* is a biennial, but if sown in March in warmth will flower the same season; it grows to a height of 2½ feet and produces large golden-yellow flowers. A dwarf-growing annual race has also been obtained.

DELPHINIUM.—The annual Larkspurs are divided into two sections, the tall and the dwarf. Some of the former, the Stock-flowered in particular, grow to the height of 3 feet, while the Dwarf Rocket, a form of *D. Ajacis*, scarcely exceed a foot. Large and finely-formed blossoms are produced in handsome spikes; and the colours vary considerably. The tall varieties of *D. Consolida* branch freely, Emperor being one of the finest. The seeds should be sown in pans, and the young plants transplanted in May in the case of heavy soils; but the seeds can be sown in the open when the soil is light.

DIANTHUS chinensis (fig. 490).—The Indian Pink, both single and double forms, and its improved variety *Hed-*

dewigii, are easily grown, and well repay good cultivation. In *Heddewigii* the flowers are considerably enlarged, and in the form known as *laciniatus* the petals are fringed. A few fine varieties, such as Brilliant, Crimson Belle, and Eastern Queen, generally come true from seed. Treated generously, the plants flower all through the summer up to November in a favourable season. A section known as *Imperialis* is taller, with smaller flowers, and is useful for cutting.

ERYSIMUM Perofskianum (Hedge Mustard) is one of the commonest of hardy annuals, and produces plentifully its trusses of deep-orange blossoms. A dwarf form known as *E. arkansanum* has bright-yellow blossoms; the seeds of both can be sown in the open ground in spring. These are the only two annual forms found in gardens. The former is sometimes sown in autumn, with the result that the plants bloom earlier.

ESCHSCHOLTZIA.—Showy hardy annuals. *E. californica* is represented in gardens by numerous varieties with yellow or orange-flowers. One called *maritima* is yellow-flowered, but spotted with deep-orange; there are some very large forms of this. Mandarin, dark bronzy-orange, and Rose Cardinal, pale rosy-pink, are worth special mention. The usual practice is to sow the seeds in the open ground in spring, to bloom in the summer. They are, however, much finer when sown in autumn, and as they stand the winter well they grow to a large size and require ample space. In a sandy soil they root deeply and bloom magnificently.

GILIA.—A large genus of hardy plants, chiefly annuals. The most popular is *G. tricolor*, 2 feet high, with lavender and white purple-eyed flowers. *G. nivalis* is snow-white with an orange eye, and is delicately scented, having a marked attraction for bees. The *Gilias* do best in a fairly light soil.

GOBELIA.—Closely allied to *Oenothera*, indeed it is included in that genus by botanists. *G. Whitneyi*,



Fig. 491.—Miniature Sunflower.

introduced from California in 1870, and its numerous garden progeny, now so widely grown, are very effective free-flowering annuals, with large heads of cup-

shaped blossoms, which, when cut, retain their beauty for a considerable time. Duchess of Albany, Duchess of Fife, General Gordon, Lady Albemarle, La Belle, The Bride, and Gloriosa, rich orange-crimson, are all delightful varieties. They do well in any good garden soil, either when sown in the open, or when raised under glass

Everlasting Flowers. It grows to a height of from 2 to 3 feet, and flowers profusely if planted in a sunny position. Colour, chiefly reddish-bronze and yellow. If cut with a good length of stem when about half-expanded, and tied in bunches and hung up head-downwards in a cool dry place, they dry and retain their form and colour and are useful for winter decoration.

HELIPTERUM.—The Australian *Acroclinium roseum* and its varieties, together with *Rhodanthe*, are now included in this genus, and may be classed among hardy summer annuals. *H. Sandfordii* of gardens is *H. Humboldtianum*, a species from Western Australia producing bright-yellow flowers; and, like those of *Acroclinium* and *Rhodanthe*, everlasting. Seeds are generally sown in March in a gentle heat, and transplanted to the open ground when it is safe to do so.

HIBISCUS africanus major is a handsome hardy annual, 2 feet or so high, with numerous large rounded blossoms, their colour a delicate primrose with a deep-violet centre.

HUMULUS japonicus and its variety *variegatus* are annual Japanese Hops, and are most useful summer creepers for covering fences and walls quickly with their ample and handsome foliage. The variegated form comes true from seeds.

IBERIS.—The Candytufts are popular by reason of their hardihood, and crimson, lilac, and white flowers. Dobbie's New Spiral has elongated large white heads. Empress is similar to it if not identical with it. Carmine, of French origin, is very fine also. The seeds should be sown in fine soil, and the plants well thinned to allow room for development, then they branch freely and flower for a considerable time.

IMPATIENS BALSAMINA (The Balsam).—The fine strains of this useful annual seem to have disappeared from cultivation, but they are worth recovering. The seeds germinate quickly if sown on a brisk bottom heat, when they should be removed to a cooler temperature. They may be sown in pots, pans, or boxes of light



Fig. 492.—Camellia-flowered Balsam.

and transplanted to the open ground. Height 12 to 18 inches.

GYPHOPHILA elegans is a useful annual 18 inches high, bearing feathery lilac blossoms, useful for bouquets. It does best in a light and fairly dry soil.

HELIANTHUS (Sunflower).—A very large genus which includes some remarkably fine annuals, double and single, large and small flowered; some very tall in growth, others quite dwarf. The giant single, *H. annuus*, with its enormous heads, will reach a height of 8 to 10 feet, while the dwarf sorts scarcely exceed a yard in height. They are admirably adapted for massing in shrubberies and the mixed border. Seeds are best sown in April, in a little warmth, the young plants to be placed out in the open when 6 inches high, after being hardened off. Or the seeds may be dibbled in the open ground in good rich soil in May. There are now miniature forms (fig. 491), which grow into dense bushes and produce their flowers in great abundance.

HELICHRYSUM monstrosum.—One of the most popular of

soil, and if strong plants are wanted the seeds should be pricked singly into the soil, sufficiently wide apart to admit of the plants being lifted with soil attaching to their roots and potted. They require rich soil, and if to bloom as pot specimens they should be grown cool with ample ventilation and moisture. Liquid manure may be given as they come into bloom. Balsams do remarkably well in an open border, in a sunny position and good soil. The Camellia-flowered (fig. 492) and the Rose-flowered are the finest strains. *I. glandulifera* and *I. Roylei*, both sturdy Himalayan annuals, 3 to 5 feet high, are useful for covering unsightly places or for the stream side, but they sometimes become weeds and are not easily kept within bounds.

IPOMŒA.—The best of the species available for out-of-door culture is *I. purpurea* in its numerous forms, popularly known as *Convolvulus major*, *C. minor*, &c. Others that may be grown in the warmer parts of this country are *I. coccinea*, *I. Learii*, and *I. rubro-cerulea*. It is usual to give these greenhouse culture, but if planted out

on a rich border they grow freely, and are often very floriferous during summer. *I. Bona-Nox*, the Good-Night flower, may also be grown against a sunny warm wall; its large white blossoms open at night. *I. versicolor* (*Mina lobata*) is an attractive and free-flowering half-hardy annual, most useful for covering a warm wall during summer. The plants should be raised under glass, hardened off and planted out at the end of May.

JACOBÆA elegans.—See under *Senecio*.

KAULFUSSIA amelloides, a native of South Africa, is an ornamental hardy Daisy-like annual, blue-flowered with a yellow disc. There are garden varieties of it with white, rose, yellow, carmine, &c., flowers. The seeds may be sown out-of-doors in ordinary soil about the middle of April; or on a hot-bed earlier in the year and transplanted.

LATHYRUS odoratus (fig. 493).—The Sweet Pea is a most popular hardy annual. It is said to have been introduced from Sicily in 1700, but it is within the last



Fig. 493.—*Lathyrus odoratus*.

forty years that improved varieties have been raised. About twenty years ago, Mr. Henry Eckford commenced to breed them, and he obtained seedlings of new colours and improvements in size and substance of flowers. New varieties have also been raised in the United States, and now the number of forms is very large. For cut-flower purposes the Sweet Pea has scarcely a rival. A dwarf type known as *The Cupid* originated in the United States a few years ago, and varieties of it appear annually.

The Sweet Pea may be grown in any garden soil, but a deep and rather heavy loam gives the best results. The soil should be deeply dug and manured in the autumn. Early sowing is important. If the seeds are sown in drills they should be prepared as for ordinary garden Peas, scattering them thinly and evenly, and

covering them with two inches of soil. As the plants grow, the soil should be drawn about the stems. If the seeds are sown in pots, six seeds in each pot will be sufficient. They can then be planted out to form a bush with the aid of pea-sticks in well-manured soil. Soaking the seeds for a few hours in water before sowing hastens germination. Those varieties with lighter-coloured seeds, such as *Blanche Burpee* and *Emily Henderson*, both white-flowered, and *Mrs. Eckford* and *Primrose*, primrose-coloured, are more liable to rot in the soil than the black or dark-brown seeds. It is not advisable to grow Sweet Peas on the same ground two years in succession. Other annual forms of *Lathyrus* deserving a place in the garden are *Lord Anson's Pea*, a form of *L. sativus*, having a lovely shade of blue, but which soon fades under sunshine; and *L. tingitanus*, the Tangier Pea, which bears large crimson and maroon flowers.

LAVATERA trimestris is a common but beautiful and showy hardy Mallow-like annual, of tall growth, and producing large and striking rose-coloured flowers. There is a white variety of it. Seeds germinate freely when sown in the open ground, but the soil should be rich and holding.

LATIA (Oxyura) chrysanthemoides (elegans), a North American species with yellow composite flowers and a pure-white variety of it, are useful dwarf annuals, about a foot in height, flowering freely, and remaining for some weeks in bloom.

LEPTOSIPHON is represented by a group of dwarf-growing annuals, raised by the intercrossing of two or three species. They are very compact in habit, and extremely free, but they do not last a great time in blossom. On warm and sunny spots and in a light rich soil they are showy and useful as edgings to plants of taller growth. *L. roseus* is particularly attractive.

LEPTOSYNE calliopsidea (maritima).—A perennial, formerly included in *Coreopsis*; grows to a height of 1½ foot, and produces large lemon-yellow Marguerite-like flowers, on long stalks. The true *L. maritima* is less than a foot high, and has smaller flowers. It is also useful as an annual. *L. Stillmani* is not unlike the last-named, but it flowers earlier, usually within a few weeks from the time of sowing. They all prefer a light soil in a sunny position, and should be raised from seeds grown in a little warmth in February, planting out in May.

LIMNANTHES Douglasii, from California, of dwarf and rather spreading growth, forms dense tufts of yellow and white blossoms in early spring. Years ago this plant was grown from seeds sown in late summer, and played an important part in spring gardening, being hardy, and coming into bloom with the Daisy and Wallflower. Bee-keepers should grow it about the hives.

LINARIA comprises a large number of species mainly from the Northern hemisphere. The hardy annuals are the Portuguese *L. bipartita*, *L. maroccana* from Morocco, and several others which have been intercrossed, and from them have sprung various forms bearing particular colours, yellow, orange, crimson, and black blossoms. Being dwarf and free, they soon form a brilliant floral picture in the garden.

LINUM includes a few annuals, the North African *L. grandiflorum* (fig. 494), and its variety *rubrum*, being by far the best. The latter is known as the Scarlet Flax. It prefers light soil and full sunshine, growing to a height of 18 inches. *L. luteum* or *corymbosum* is another annual of continental origin.

LOASA lateritia (L. aurantiaca), though a half-hardy perennial, is so much employed as an annual that

it may be included here. Its twining, free-flowering habit and large red blossoms make it a useful summer climber. Seeds sown in light sandy soil in May ger-



Fig. 494.—*Linum grandiflorum*.

minate readily; it is usual to raise them in heat and transplant to the open ground in May. The leaves sting, so that it requires careful handling.

LOBELIA.—The South African *L. Erinus* has come to play a very important part in the flower-garden in summer. Numerous seedling varieties of it have originated in gardens; they are dwarf and compact, and very floriferous, and are largely employed for summer bedding. Their colours include various shades of blue, crimson, and purple, also white, the blue-flowered sorts being most esteemed. They come fairly true from seeds, but the white kinds have a tendency to revert to the type. Usu-



Fig. 495.—*Lychnis Haageana*.

ally, however, when employed for bedding purposes, they are propagated from cuttings, which strike freely in a little warmth. Seeds should be sown in pans in a warm house

or frame, where they quickly germinate. As soon as the second pair of leaves are developed the seedlings may be transplanted to other boxes, and grown on until large enough to be hardened off before planting them in the open. Some of the most popular varieties are Blue Stone, Crystal Palace compacta, Emperor William, *pumila magnifica*, &c., blue; Prima Donna, crimson; Royal Purple, purple; White Gem, White Lady, and White Perfection, white.

LUPINUS.—It would be difficult to trace the parentage of the garden Lupins; probably, however, most of them have sprung from *L. hirsutus*, *L. luteus*, *L. mutabilis*, *L. nanus*, and *L. polyphyllus*. They are free-blooming generally, but their flowers are of short duration. The prettiest of the dwarf sorts are the forms of the blue-flowered *L. nanus*. The seeds of this are much smaller than those of other species and varieties. A selection of good sorts would include *Cruikshankii*, *subcarneus*, *hybridus oco-*



Fig. 496.—Ten-week Stock.

cineus, *superbus*, and *Dunnettii*. The seeds should be sown in the border in April.

LYCHNIS *viscaria* and the few varieties derived from it are useful when treated as annuals, such forms as *cardinalis* and *occulata* being quite showy while they last. They average about a foot in height, and will grow and bloom freely in moist soils. *L. fulgens* and its variety *Haageana* (fig. 495) may also be grown as annuals in the warmer parts of the country by sowing the seeds in heat in early spring and planting the seedlings in a sunny bed or border of light soil in June. They have sturdy stems and leaves, and large flat *Dianthus*-like flowers of a bright-red colour.

MALCOLMIA *maritima* (Virginian Stock).—One of the prettiest of hardy annuals, being dwarf, profuse, and quick to bloom, and doing well in almost any soil and position, even in gardens in some of the most densely-populated districts of London, where but very few annuals will thrive. There are varieties with rose, crimson, white, and yellow flowers. It will sow itself where it has flowered, come up, and bloom the same season. Few annuals so well deserve a place in the garden.

MALOE trifida, a native of Southern Spain, is one of the most showy hardy annuals, with large crimson flowers. There are rose, white, and striped forms of it, all very ornamental, and growing freely from seeds. The average height is about 15 inches.

MATTHIOLA (Stock).—A popular genus which in some form or other can be found in every garden, and in cottage



Fig. 497.—*Matthiola annua*.

gardens superior strains of the Brompton Stock often form the chief ornament. The various forms of Ten-week Stocks (fig. 496) are from *M. annua*, which was introduced from Southern Europe in 1731. The Wallflower Stock (fig. 497), the Brompton and Queen strains, treated as biennials, are said to be from *M. incana*, also a native of Southern Europe. The Wallflower-leaved Stocks have shining green smooth leaves, the others have soft and downy leaves of a glaucous tint. But the Wallflower foliage will appear among seedlings from downy-leaved strains. There are several other sections, viz. the Common Ten-week, which includes the Large-flowered, the Pyramidal, and the Giant Perfection. In Germany especially, our Ten-week Stocks have become greatly improved, especially in the matter of white varieties. The Intermediate Stocks, scarlet, white, and purple, which are treated as biennials, are thought to be forms of the Ten-week, changed somewhat by culture. The East Lothian Intermediate Stocks represent a very fine Scotch strain, modified by climate. These are largely employed for garden decoration in summer. The Brompton and the Queen types are distinguished by differences in the foliage, and the colour of their seeds. Large double-flowered crimson, purple, and white forms of the Brompton type are also grown, but they do not readily breed true from seeds. A few years ago a particularly fine strain of the Giant White was grown about London, but it appears to have become entirely lost.

Seeds of Stocks germinate freely when new and good; the best seed-beds are pans or shallow boxes, filled with a sandy compost, sowing the seeds thinly. Light and air are essential to a robust growth. When large enough the seedlings may be pricked off into a bed prepared in a cold frame kept a little close and shaded for a time, and then assisted to develop as lustily as possible. Incautious watering will sometimes cause the seedlings to damp off

close to the soil. They are impatient of watering overhead. To do Stocks full justice they should be planted out in rich soil, to encourage them to develop not only their main stem, but also their side branches to the best advantage.

MESEMBRYANTHEMUM (Fig-Marigold).—A very large genus of herbaceous plants, chiefly South African. Several of them are annuals which thrive in the open air in summer in this country. The best is *M. tricolor* (fig. 498), which forms neat compact tufts 6 inches high, spreading freely over the ground and flowering profusely in sunny weather, the flowers being Daisy-like, purple, rose, and white. *M. pomeridianum* has large fleshy leaves and Marigold-like yellow flowers 3 inches across. *M. cordifolium* is represented by a variegated form which is sometimes grown for summer bedding. *M. crystallinum*, the Ice Plant, deserves a place because of the interesting character of its leaves, which are covered with crystal-like pustules of ice-like appearance. The seeds of these should be sown in a frame or boxes in March, the plants to be transferred to the open border in the bedding season. They must have a sunny position, and if fairly dry so much the better.

MIMULUS (Monkey Flower).—During the past twenty years the *Mimulus* has been improved by crossing *M. luteus* and *M. cupreus*, the hybrids being called *M. maculatus*, with flowers mostly pale-yellow, heavily spotted and blotched with various tints. The seeds should be sown thinly in March in a pan of very finely-sifted soil. As soon as the little plants will bear it they should be transplanted into pans or boxes and grown on until they are ready to be planted outside. They may also be cultivated in pots, in a frame, as they make a showy display and bloom freely and continuously. They seed freely, and the varieties come fairly true from seed. As the root-stock is perennial, they may be propagated by division, but seedlings produce the finest blossoms.

MIRABILIS jalapa (Marvel of Peru) is a perennial, though generally grown as an annual. The seeds are

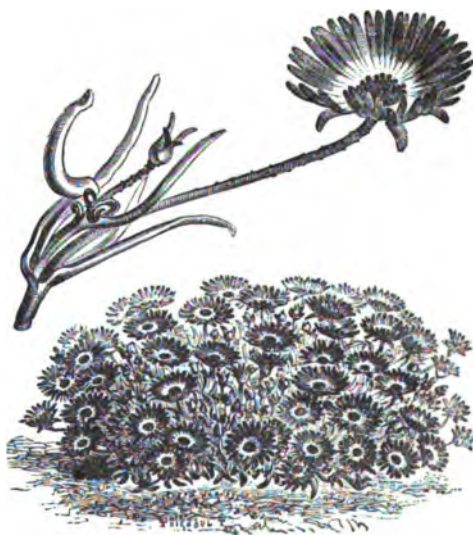


Fig. 498.—*Mesembryanthemum tricolor*.

sown in warmth in spring, and the seedlings planted out early in June, when they bloom profusely until late in the autumn. *M. longiflora*, the long-tubed Marvel of

Peru, is very variable in the colours of the flowers; there are varieties with variegated leaves, and a dwarf or Tom Thumb section also.

MYOSOTIS (Forget-me-not).—This genus includes several



Fig. 499.—*Nigella*.

which are treated as annuals, viz. *M. alpestris*, blue, and its varieties white and sky-blue; *M. dissitiflora*, a biennial which is annually raised from seeds; and *M. sylvestica* and its varieties. The two latter somewhat nearly approach each other, but the former is finer, while differing somewhat in growth and in the character of the seeds. *M. alpestris* is frequently cultivated in pots. Plants of *M. dissitiflora* can be divided, but they are best when raised from seeds sown in July.

NEMESIA strumosa, a recently introduced annual from the Cape, produces varieties of differing shades of colour—white, pale-yellow, crimson, &c., and these in various combinations. The plant attains a height of 12 to 15 inches. The seeds should be sown in spring, somewhat thickly. They are most effective when massed. If grown under glass the seeds may be sown at any time of the year; thus treated, the flowers come larger and better in colour. *N. floribunda* and its variety *compacta* are pretty little low-growing summer-flowering annuals, with white and yellow fragrant flowers.

NEMOPHILA.—Useful dwarf hardy annuals, natives of North America. They are easily cultivated and free-flowering. The best-known and prettiest is the blue *N. insignis*, of which there are several varieties, such as the white, the margined, purple-and-white, and the purplish-rose. Another pretty species is *N. maculata*; the lobes of its large saucer-shaped blossoms have each a dark-purple spot or blotch. Its seeds are larger and different in colour from those of *N. insignis*. *N. Menziesii* (*atomaria*) is distinct, and there are several varieties of it. If the seeds be sown in autumn and the plants kept through the winter, they bloom much more finely in spring than when sown in spring to flower in summer.

NICOTIANA (Tobacco Plant).—*N. affinis* is a most popular and fragrant annual, thriving in small and confined plots in thickly-populated parts of London. Its height is about

3 feet, and the long-tubed fragrant white blossoms are freely and continuously produced. *N. sylvestris* is a beautiful fragrant white-flowered species of recent introduction, which has become highly popular on account of its robust stature, large leaves, and numerous flowers produced in dense panicles, and remaining expanded throughout the day. The large-leaved forms of the Common Tobacco, *N. Tabacum*, are striking objects in the sub-tropical garden, and in various sheltered spots. The seeds should be sown in March under glass, and the seedlings transplanted to the open in favourable weather about the end of May.

NIGELLA (Fennel Flower).—*N. damascena* is sometimes known as the Devil-in-the-bush; it has both pale-blue and white flowers, as well as double varieties. *N. hispanica*, Love-in-a-mist (fig. 499), is represented by white and purple forms; the average height of the plant is 18 inches. Seeds may be sown in the open ground in March and April.

NOLANA.—Trailing, compact, Convolvulus-like annuals, of which *N. grandiflora* and *N. prostrata* are sometimes grown. They form cushion-like tufts of tongue-shaped leaves, and saucer-shaped white and blue flowers; seeds may be sown in the open ground in spring.

NYCTERINIA, now included under *Zaluzianskya*, is represented by *N. capensis*, white, and sweet-scented; and *N. selaginoides*, of dwarf tufted growth, with lilac-coloured flowers. They are well adapted for culture in pots. The seeds should be sown in heat. Natives of South Africa.



Fig. 500.—*Petunias* (single).

ENOTHERA (Evening Primrose) includes a few showy annuals, chief among them being *E. acaulis*, dwarf in growth, with leaves in a rosette, and bearing large white

blossoms; *C. bistorta Veitchii*, yellow, with slight crimson blotches, 1 foot; *C. rosea*, rose-coloured; *C. Drummondii*, yellow, and its varieties tall and dwarf; and others. They all grow rampantly in any garden soil, and are most effective in the evening. In some gardens they are naturalized, coming up promiscuously like weeds. Their near allies, the Godetias, are powerful rivals to them as far as use in the flower-garden is concerned. *C. biennis* is a handsome biennial, which may be grown as an annual by sowing the seeds in autumn. It is 3 to 5 feet high, with large bright-yellow flowers. *C. triloba (rhizocarpa)* is a hardy annual of dwarf growth, with large showy yellow flowers.

OMPHALODES linifolia (Venus's Navelwort) is a silvery-foliaged hardy annual growing to a height of nearly 9 inches, and bearing white flowers.

PAPAYER (Poppy) includes many brilliant annuals, some of mixed parentage, and difficult to fix botanically. Shirley Poppies are improved forms of *P. Rhæas*, which have developed many beautiful tints and combinations of colours. They produce the finest blossoms when they are sown in the open in late summer where they are to flower. *P. pavoninum*, the Peacock Poppy, is represented in gardens by named varieties. *P. umbrosum* appears to be a dwarf form of *P. Rhæas*. *P. somniferum*, the Opium Poppy, has produced many varieties, double and single; some entire-petalled, others with lacinated margins, but the duration of the flowering period of these is short. *P. Rhæas* and its allies are better, because they continue in flower longer, especially if the decaying blossoms be kept picked off. The double forms of this are known as Ranunculus Poppies.

PETUNIA.—A most useful addition to half-hardy annuals has been developed from *P. violacea*, previously known only as a greenhouse plant, and grown along with Heliotrope, &c., for summer bedding. The colours of the flowers are varied and pleasing, whilst the habit of the plants is all that could be desired. They like a sunny position and a light well-drained soil. The seeds should be sown in heat in February, and the seedlings, when large enough, should be transplanted singly into small pots to be planted out in borders, &c., towards the end of May.

PHACELIA campanularia (fig. 501) has bright-blue bell-shaped flowers which are highly attractive. It is an excellent plant for sowing over ground containing bulbs at rest. The seeds can be sown in the open in March, and the plants, which reach a height of 6 to 9 inches, come into bloom early and continue to flower till autumn. *P. Whillavia*, a Californian annual from which some fine varieties have been obtained, particularly *grandiflora*, violet, and *glorinoides*, blue with a white throat. They flower freely, the colours being intensified by cultivation in rich soil.

PHLOX Drummondii may be said to have taken the place of the Verbena in the flower-garden, as it has at many provincial flower-shows. The Continental florists have done much to improve the strain, the large-flowered varieties being really superb. *Graf Gero*, *hortensiaeflora*, *Heynholdii*, and *cuspidata* are some of these forms. The last-named has irregularly-edged corollas which have developed spines of varying length. It is requisite to sow the seeds in heat and transplant to open ground to flower.

PLATTSTEMON californicus, the Californian Poppy, is a showy dwarf hardy annual, bearing bright lemon-coloured flowers, and growing to a foot in height.

PORTULACOA, popularly termed the Sun Plant, is an improved form of the Brazilian *P. grandiflora*. Of dwarf tufted growth, and bearing saucer-shaped corollas of various brilliant hues; there are double-flowered forms also. They do best on a warm sunny border in a light sandy soil. The seeds can be sown in the open in light soil, otherwise in boxes, and transplanted in May.

RESEDA odorata (Mignonette) is one of the most fragrant of hardy annuals. When first introduced from North Africa the blossoms were yellowish-white, but by cultivation and selection they have nearly approached white on the one hand, and yellow, orange, and red on the other. The quality of the flowers is very much a question of selection. Only by saving seeds from the very finest can the strains be maintained. It is largely grown in pots for market, the seeds being sown in September in



Fig. 501.—*Phacelia campanularia*.

the pots in which the plants are to bloom. Mignonette requires rich soil, with ample space for the individual plants to develop, and then the result is satisfactory. The varieties Bismarck and Matchet are the best of the reds, Cloth of Gold and Golden Queen among the yellows, and Parson's White among the whites.

RHODANTHE (fig. 502).—This genus is now included in *Helipterum*. *R. Manglesii*, and its varieties *atrosanguinea*, *maculata*, and carmine double, are largely grown in pots for market. The flowers are also useful as Everlastings for winter decoration. If to be grown in the open ground, the seeds should be sown on rich, light, sandy soil in March.

RICINUS communis, the Castor-oil Plant, and its varieties are worthy plants for borders or beds in summer. They are readily raised from seeds sown in warmth in March, and put out in the open when hardened off.

SALPIGLOSSIS.—The varieties of *S. sinuata*, a native of Chili, are so varied and rich in colour that they have been described as the Orchids among hardy annuals. When well grown they average 2 feet in height, and they are both profuse and lasting in bloom. Seeds sown in the open ground in good soil in March yield plants which, if allowed ample room, will be full-grown and in flower by June. In colder parts of the country the seeds

should be sown in a little heat. The dwarf varieties are better suited for small gardens.

SALVIA.—A large genus, which includes a few good annuals, viz. *S. carduacea*, lavender-blue, and *S. prun-*



Fig. 502.—*Rhodanthe Manglesii*.

lodes, also blue, but they are rarely seen in gardens. A variety named *Blue Beard* is a form of the last-named.

SANVITALIA procumbens is a useful dwarf Mexican annual, bearing small Sunflower-like blossoms, yellow, with a dark disc. A double form of it flowers freely until late in the autumn, and is an excellent edging plant.

SAPONARIA (Soapwort) is represented by one annual species, *S. calabrica*, and several varieties, all of which can be grown in the open air. It is of compact growth, about a foot high, and the small rose-red, pink-like blossoms are freely produced. The seeds should be sown in the open ground in March.

SCABIOSA.—The popular annuals, or, as grown by some, biennials, of this genus are varieties of *S. atropurpurea*, a native of Southern Europe. They vary in height from 1½ to 3 feet, and also in the size, colour, and fulness of their flowers. If the seeds are sown in boxes under glass in March, the plants will be ready to put out in May. In warm situations they may be sown in the open ground. They also do well when treated as biennials, sowing the seeds in April and treating the plants to flower in the following year. Some prefer to sow the seeds in pans or boxes in August, and grow on the plants in cold frames to flower in a cold house in early spring. They are most useful, easily-grown plants.

SCHIZANTHUS.—The Butterfly- or Fringe-Flowers are varieties of *S. pinnatus* and *S. retusus* (fig. 503). They are grown to flower in spring and early summer by sowing the seeds thinly in large pots in August and September and growing on the plants all the winter in a frame or

greenhouse. Thus treated they form large bushes, a yard high, covered with elegant, many-coloured flowers, and are excellent for the conservatory. If to be grown outside, the plants should be raised under glass and planted in the open in May.

SCHIZOPETALON.—This genus includes a pretty white annual of medium growth, the flowers of which are pleasantly fragrant in the evening. It is usual to raise the seeds in pots in a compost made up of loam, peat, and sand, planting the seedlings out in the border in May.

SENECIO elegans.—The Purple Jacobaea is a useful free-flowering, hardy S. African annual, growing in the form of compact bushes 1½ foot high. It is much employed for bedding purposes in summer. There are several varieties, with flowers varying from crimson to purple, white, rose, &c. There is a dwarf strain, *nana*, and there are forms with double flowers. Seeds may be sown in a moderate heat, and grown on into size, hardening the plants in a cold frame preparatory to planting out in a sandy soil. The blossoms are produced from July to October.

SILENE (Catch-fly).—There are two useful annual species of *Silene*, viz. *S. Armeria*, a loose erect grower 18 inches high, with numerous bright-rose flowers; *S. pendula*, and its variety, *compacta*, both glaucous-green dense plants 18 inches high, with crowded heads of carmine flowers both



Fig. 503.—*Schisanthus retusus*.

single and double, very free-flowering, and particularly serviceable in early spring. Seeds can be sown in the open ground in March and April for summer blooming, and in August for a spring display.

SPECULARIA (Venus's Looking-glass).—There are six annual species in this genus, which is closely allied to *Campanula*, the best-known being *S. Speculum* and its several varieties. The seeds should be sown in early

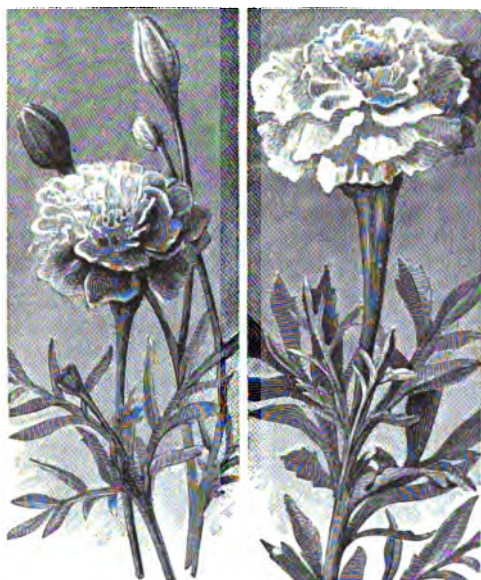


Fig. 504.—Marigolds.

spring in a sunny position. The star-shaped, purplish flowers are borne in June.

STATICE (Sea-Lavender).—The annual species of this genus are *S. Bonduelli*, golden-yellow, a foot high; *S. spicata*, rose-purple; and *S. Suworowi*, rose. These are worth growing in borders, as they flower freely, and all through the summer if raised under glass in early spring and planted in a sunny position outside in May. The flowers may be cut and dried to be used as Everlastings. Some pretty forms of *S. sinuata* have been originated by the German florists.

TAGETES (French and African Marigolds) (fig. 504).—These are represented by two distinct types, viz. the strong-growing tall African *T. erecta*, and the dwarf Mexican *T. patula* (French Marigold). *T. patula* has yellow flowerets, striped with bright maroon. High character in both sections is maintained only by persistent selection and good cultivation. The seeds are sown in heat, and the plants hardened off and planted out in the open at the end of May or early in June. A dwarf form of the Mexican *T. signata*, named *pumila*, is one of the most persistent of the summer annuals. A pretty single form of *T. patula*, named Legion of Honour, has dark florets broadly edged with yellow. A double garden dwarf form, known as *aurea floribunda*, is useful as a summer bedding plant. Seeds saved from the largest double varieties yield a varied percentage of single-flowered forms.

THUNBERGIA.—The annual species of this genus are not now so popular as they were. *T. alata* and its varieties, with white or yellow dark-eyed flowers, are charming summer climbers and trailers. The seeds should be sown in pots under glass, and the seedlings planted out in the open in warm sunny spots. They are also useful for furnishing vases.

TROPÆOLUM (Nasturtium or Winter-Cress).—The many forms of *T. majus* are among the most free-flowering of

annuals, whether the plants be of a dwarf, compact, bush habit, or trailers. In rich soil they make vigorous growth, and continue in bloom till late in the year. Grown in poorer ground they flower with greater freedom, but the floral display is not so prolonged. The dwarf or Tom-Thumb section is a sport from *T. majus*, and by means of selection some most useful bedding varieties have been obtained. Some of the forms are found useful for winter effect in greenhouses. The seeds may be sown in the open in late spring, or in warmth, and transplanted. To keep any type or variety true to character, rigid selection is necessary.

URSINEA pulchra.—A pretty little annual composite from Mexico, also known as *Sphenogyne speciosa*. It forms Daisy-like tufts of short stems from which spring the slender, erect flower-stems, a foot high, bearing single heads of yellow, dark-eyed flowers. There are several colour-forms of it, viz. *aurea*, *purpurea*, &c. The seeds may be sown in the border in autumn, where the plants grow and mature through the winter, to flower in April and May.

VENIDIUM calendulaceum is a somewhat prostrate-growing annual, having bright, clear, yellow flowers greatly resembling those of a single Pot-Marigold. It is very attractive, but is not so much grown as it deserves to be. It does best on a warm, sunny border, in light soil.

VERBENA.—There is reason to believe that several species were utilized many years ago for the production of our garden Verbenas. They are now mainly employed as bedding plants, being raised from seeds sown in heat in early spring, as they quickly germinate in light, rich soil. They are potted off or transplanted into boxes, hardened off to be placed in beds and borders, where they grow very rapidly and soon flower, continuing in bloom until quite late in the summer. Although not now so much valued as a florist's flower, a few named varieties are still cultivated, and increased by means of cuttings.

XERANTHEMUM annuum and its varieties, single and double flowered, form a group of useful and interesting Everlastings, the seeds of which can be sown in the open ground, in light, rich soil, where the plants are to bloom.



Fig. 505.—Zinnia.

The colours are purple, white, rose, &c. For preserving, the flowers should be cut with stems when about half expanded, and allowed to dry in a cool place.

ZINNIA (fig. 505).—There was a time not very remote

when only the single form of *Z. elegans* was found in gardens—of somewhat tall and branching habit, and with very showy flowers. In course of time a double form appeared, and, by careful breeding and selection, the flowers are now large, full, very handsome, and varied in colour. Seeds are sown in a little warmth in spring, the plants grown on, and gradually hardened off for putting out in the open. During the seedling stage they should not be starved or receive a check, or they will not bloom well in the open ground. The soil should be deep and rich, and then the finest development may be looked for. The plants form handsome bushes and are prolific of bloom. *Z. Haageana*, an improved form of *Z. mexicana*, has both single and double flowers, but it is not so popular as the older race. A strain of hybrid origin, known as *Z. Darwini*, is probably from *Z. elegans* and *Z. multiflora*. All the varieties remain in flower for a considerable time.

[R. D.]

CHAPTER XXVII.

POPULAR GARDEN PLANTS.

The Achimenes.—These beautiful and free-flowering plants are useful for the summer decoration of conservatories, &c. Most of the

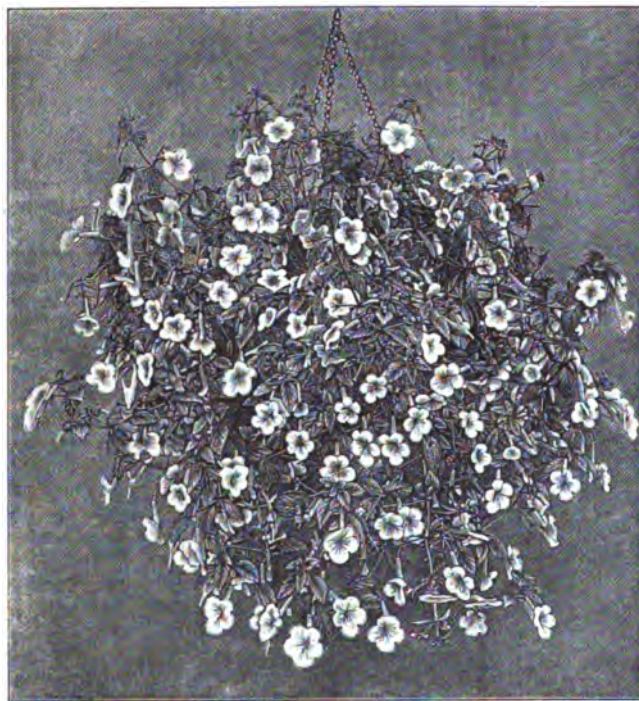


Fig. 506.—Achimenes.

favourite sorts are of hybrid origin, having been raised from species introduced principally from the warm regions of South America; consequently they will bear a considerable amount of heat, though in the summer, when they flower, they will do in a house without artificial

warmth, provided they are not exposed to currents of cold air.

They should be started into growth in March, in pots or pans filled to within 1½ inch of the rim with fine sandy soil, placing the tubers 1 inch apart, and covering them over with a little soil. A stove with a night temperature of 65° or thereabouts soon starts them into growth, and when the stems are 2 inches long they may be potted into 8- or 10-inch pots or pans, in a soil composed of three parts good fibrous loam, two parts sifted leaf-mould, and a moderate sprinkling of sand. A shelf near the roof-glass in a warm house is a good place for them. When the stems are 6 inches long pinch out the points so as to induce a branching habit. In all stages of their growth they must be well supplied with water.

When the flower-buds are formed, give manure-water two or three times a week, and harden the plants off until when in flower they may be transferred to the conservatory. When the tops have died down the tubers may be kept in dry sand in a temperature of about 50° for the winter; or if room can be spared, they may be allowed to remain in the pots, in which way they generally keep the best. Grown in wire-baskets (see fig. 506) lined with sphagnum, and some of the plants put in so as to grow through the bottom and sides of the baskets, they are very effective when suspended in a conservatory.

They multiply themselves most prolifically by means of their worm-like scale-clothed tubers. They may also be raised from seeds sown in early spring and treated as Gloxinias.

There are numerous named sorts, some of the best being the following:—

Admiration, red-purple.

Alba maxima, white.

Aurora, red.

Celestial, mauve.

Coccinea, scarlet.

Firefly, crimson.

Grandia.

Lady Lyttelton, scarlet.

Longiflora, blue.

Margarita, white.

Masterpiece, purple,
white throat.

Mauve perfection.

Rosy Queen.

Scarlet perfection.

Splendens, scarlet.

Anemone (Wind-flower).—Several species of this large and useful genus have long been

favourite florists' flowers, and they have consequently developed a considerable range in variety of colour, size, shape, &c. The oldest of these is the Poppy Anemone (*A. coronaria*), which has been a garden plant for the last three centuries. It requires a rich, deeply-dug soil, light rather than heavy, and well-drained. Some growers place a layer of cow-dung a foot below the surface of the soil for the roots to lay hold on when growth is vigorous. The bed should be raised a few inches above the ground level. The tubers, which are dry and shrivelled as obtained from dealers, should be planted on an open day in January or February rather than in October, the danger from early spring frosts being thus avoided, although better results are undoubtedly obtained when the planting is done in September or October, and the weather is favourable for the development of the flowers in spring. The tubers should be planted 2 inches deep and 9 inches apart. The bed should be kept clear of weeds, and a mulching with fine decomposed manure and leaf-mould be given in early spring. This assists to economize moisture in summer. The beds must be watered freely in dry weather. Early in August the plants show signs of ripening by the foliage turning yellow; the tubers should then be lifted with some earth attaching to them, and stored away for planting another season. Seedlings can be raised from the best varieties. The seeds should be sown as soon as ripe in a box of sandy loam and leaf-mould, distributing them thinly over the surface, and just covering them with soil. Over this lay a covering of moss, and place the box in a cold frame; the seeds germinate in about a month, and the seedlings, if planted out in the autumn, should bloom the following spring.

A. hortensis (fig. 507) is best known by its beautiful variety the scarlet Wind-flower, popularly known as *A. fulgens*. It is not always happy in the open air in England, but in sheltered situations where the conditions are favourable its rich scarlet flowers produced in May are a brilliant picture. It likes the same sort of soil as *A. coronaria*, and should be transplanted in the autumn. A few patches of it in the rock garden are effective. It is also useful as a pot plant for the conservatory. For this purpose the tubers should be potted in autumn rather thickly in 6-inch pots of good loamy soil, and kept in a sunny cold frame all winter. They flower usually in March or April, when they are valuable for decoration. Other varieties of the Garden Anemone are *stellata* and *pavonina*, which are also worth growing as advised for the first-named.

A. japonica (the Japanese Wind-flower) and its varieties are useful for flowering in late summer and autumn.

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They are perennial, perfectly hardy, succeeding in any good garden soil, and in almost any position; growing and blooming abundantly when subject to generous cultivation. The type is about 2½ feet in height, with large rose-coloured flowers, semi-double, and very handsome. The variety *alba* or Honorine Jobert is taller in growth, and has pure-white, quite single flowers; another form,



Fig. 507.—*Anemone hortensis*.

called Lady Ardilaun, also pure-white, has larger flowers and bolder foliage. A form of American origin, Whirlwind, is also white, semi-double, and a striking border plant. *Rosea* or *hybrida* has pale rose-coloured flowers. This species and its varieties are propagated with great readiness from pieces of the root-stock. They are all most useful plants for the border, and also for beds on lawns.

[R. D.]

Antirrhinum (*Antirrhinum majus*, fig. 508).—The great Snapdragon, originally introduced from the shores of the Mediterranean, is now abundantly naturalized in this country. It also ranks among the most constant and showy of our hardy summer and autumn flowers, having been improved and varied by cultivators in the size, shape, variety of hue, and rich marking in the flowers, as well as in the height and habit of the plant. With liberal treatment it has been known to reach a height of 7 feet, by 5 feet in diameter. On the other hand, there is now a dwarf strain which rarely exceeds a foot in height, although the flowers are as large as in the tallest forms. Well-grown plants of some of the forms have produced racemes 20 inches

long. Seeds sown in early spring will produce flowers the following autumn, although, if the season should prove uncongenial and tardy, the plants do not flower till the early autumn frosts begin to set in. The seeds are sown thinly in



Fig. 508.—*Antirrhinum majus*.

pans or shallow boxes of light, sandy soil, and barely covered with fine soil. Placed in a gentle bottom-heat, the plants appear above the soil in a few days. They should remain in the boxes until large enough to be planted out in the open in good soil during showery weather. As a severe winter is sometimes destructive to the Snapdragon, it is well, as a matter of precaution, to make a second sowing in July and August, wintering the plants in a cold frame and planting them out in March and April. Those seedlings with light stems and leaves produce light-coloured flowers; and those with dark stems and foliage, dark-coloured.

Snapdragons are most effective when planted in a bed, a number of varieties together. They grow in any good garden soil, but stiff clays should be lightened by the addition of humus, road-grit, &c. A friable yellow loam is best, and it should be deeply dug and manured, and, previous to planting, a good dressing of leaf-mould should be forked into the bed. The plants should be 18 inches apart. They must be regularly watered in dry weather. Good varieties should be marked for propagation by means of cuttings. To maintain the effectiveness of the bed, all the flower-spikes should be

cut away as they fade, leaving a few on any fine varieties for seeds. Thus treated the plants will continue to flower until cold weather stops them.

Cuttings of young shoots taken from the base of the plants in July or August and inserted in pots or pans in a cold frame soon root. They should then be potted off singly into small pots to winter, and kept in the frame till spring. Another method is to put a few old plants into gentle heat in spring and cause them to put forth growths, which can be struck in bottom-heat in the same way as Verbenas and Fuchsias. The Tom Thumb section is of dwarf bushy habit, and is useful for borders and small beds.

Such fine varieties of this popular flower are now produced from seeds, that the naming of varieties has ceased to be necessary. [R. D.]

Aster.—The United States of America may be taken as the head-quarters of this genus, which contains about two hundred and fifty species, one hundred and fifty of which are natives of that country. The rest are scattered over Europe and Asia, many handsome forms being found in the Himalaya.

The section generally known as Michaelmas Daisies contribute the great bulk of the kinds grown in gardens, and, flowering as they do late in the year, when nearly everything is over or has been cut by early frost, they form a valuable class of plants.

The facility with which the species hybridize has resulted in a great number of garden forms, in fact most of the varieties grown are the offspring of not more than twenty species. Several species, so called, grown in gardens are unknown in a wild state. Besides being indispensable as border plants for autumn display, and for cutting purposes, they are very effective when planted amongst shrubs. Although there is no great diversity of colour in the genus the habit of the several species varies much, and, grown with other late-flowering plants, such as Solidagos and Sunflowers, they are most serviceable. Some of them are worth an entire bed in a conspicuous position on the lawn, and if allowed plenty of room they develop numerous lateral branches, forming perfect pyramids of flowers.

The cultivation of Asters generally is not difficult. Care should be taken that they do not grow together and intermingle. They should be taken up and divided early in spring, just when fresh shoots are showing, selecting pieces from the outside of the clumps for re-

planting, the middle nearly always being exhausted. They like a deep well-manured soil, although many will grow under conditions far less favourable.

The following are the most desirable kinds:—

1. *acris*.—An early-flowering sort, very free, forming a mass of blue $1\frac{1}{2}$ to 2 feet high. Rather variable, there being a dwarf form *nanus* suitable for a rockery.

A. Amellus (fig. 509).—Early, sturdy, and dwarf, good for beds or the mixed border. Flowers purple-blue,



Fig. 509.—*Aster Amellus bessarabicus*.

large; disc yellow. Good varieties of this are *amelloides*, *bessarabicus*, and *major*.

A. cordifolius.—Graceful, rather tall, usually about 4 feet high; flowers in dense plumes, late in autumn. Recommended for growing amongst shrubs if the situation is not too dry. There are three well-marked varieties, viz. *Diana*, pale-lilac; *Albula*, lilac and white; *elegans*, bright-lilac.

A. diffusus.—The two best forms of this are *pendulus*, with tall arching stems and white flowers; and *horizontalis*, dwarf and bushy, with horizontal lateral branches, and an abundance of red and white flowers.

A. grandiflorus (fig. 510).—A free late-flowering species with erect, much-branched stems 3 feet high, and large bright-purplish flowers, produced in November or December. Requires a sheltered position. A good plant for pot-culture.



Fig. 510.—*Aster grandiflorus*.

A. lavis.—This and *A. Novi-Belgii* are the parents of most of the garden forms. They vary in height from 2 to 5 feet. Some of the best are:—*Apollo*, purplish stems sparingly branched, with numerous deep-lilac flowers; *Arcturus*, with black

stems and rosy-lilac flowers; *Ariadne*, purple stems, bushy, deep-lilac flowers $1\frac{1}{2}$ inch in diameter; *decorus*, dwarf, bushy, with pinkish flowers; *Pygmalion*, dwarf, with bright-lilac cup-shaped flowers.

A. Nova-Anglicæ.—Tall, and one of the latest; there are four varieties, all large-flowered, viz.: *pulchellus*, deep violet; *præcox*, purple; *roseus*, pale-rose; *ruber*, rich deep-rose. These are well adapted for growing in shrubberies in large masses, where they produce a most pleasing effect.

A. Novi-Belgii.—The numerous forms of this are of great value in the garden, being tall and sturdy, and producing an abundance of flowers varying from blue-purple to white. The best of them are:—*Albion*, dense bushy habit, white; *Archer Hind*, bushy, pale rosy-lilac; *densus*, bushy, flowers numerous, lilac-purple; *Harpur Crewe*, tall, white, tinged with rose when old; *lævigatus*, dwarf, very bushy, deep-rose; *Robert Parker*, tall, lilac-purple, $1\frac{1}{2}$ to 2 inches in diameter.

A. paniculatus.—The variety *W. J. Grant* is a graceful free-branching form producing numerous pale-mauve flowers.

A. puniceus.—Tall and sturdy, flowers rosy-lilac; the variety *lucidulus* has purple stems and pale-lilac flowers, and *pulcherrimus* has white flowers tinged with lilac.

A. versicolor.—Of dwarf prostrate habit, bearing white and pink flowers.

The following are smaller-growing species, most suitable for the rock garden:—

A. alpinus, the mountain Aster, and its rose and white coloured varieties.

A. diplostephioides.—From the Himalaya, with rich bright-lilac flowers, 4 inches in diameter, borne singly on long stems.

A. Stracheyi.—A miniature gem with purple-blue flowers.

A. Thomsoni.—A neat compact plant, the flowers being large and pale-lilac in colour.

The China Aster, generally associated with this genus, is properly a *Callistephus*, which see.

The Auricula (*Primula Auricula*) ranks among the oldest of garden flowers. In Gerarde's *Historie of Plants*, published in 1597, eight varieties of "Beares Eares" are figured and described, some of them being varieties of the Auricula, whilst others are not. According to Parkinson the Auricula must have been a favourite garden flower in his time (1629-40). In the *Paradisus* he describes twenty-one varieties, their colours being "purple, tawny, blood-red, violet, blush, scarlet, rose, white, yellow, hair-coloured, and yellowish-green with purple edge". Philip Miller, in his *Gardeners' Dictionary*, published in 1733, says of the Auricula: "To enumerate the diversities of this plant would be almost endless and impossible, for every year produces vast quantities of new flowers, differing in shape, size, or colour".

It is generally believed that the progenitor of the garden Auricula is *Primula Auricula*. We can

easily trace the yellow and buff selfs of the early writers breaking into the flakes and stripes of the *Flora Exotica* of Count Dermatt, the green edge of Painted Lady Diamond, and the white edge of Honour and Glory. The origin of the black and purple-coloured forms is not so clear,



Fig. 511.—Auricula.

but it is probable that the purple-flowered *P. venusta* has played some part in their evolution.

The origin of the Alpine Auricula, cultivated by Carolus Clusius in Vienna as early as 1582, would appear to be *P. Auricula* and *P. pubescens*, the latter a natural hybrid producing rosy-crimson flowers.

Hogg's *Treatise on Florists' Flowers*, published in 1824, mentions ninety-three varieties of edged Auriculas and thirteen selfs; but no distinction is made between the green, gray, and white edges. This has been done in more recent years, the show Auricula being divided into four well-marked divisions—viz. green-edged, gray-edged, white-edged, and selfs. The Alpine Auricula as a florist's flower is divided into white-centred and yellow-centred varieties.

The characters of these are as follows:—

Green-edged.—Leaves invariably green. Flower-tube yellow, the mouth filled with the anthers: the pistil should be hidden by the anthers. The limb or radiating part of the corolla is densely coated in the centre with a white farina or powder called "paste"; next to this is the ground colour, a violet, purple, or deep-maroon, in some instances a blue-black or a purple-black; the inner margin of this ground colour should form a perfect circle around the white paste, the outer margin being more or

less irregular. The edge should be of a lively green colour as free from paste as possible. A pale-coloured tube or angular paste are serious faults.

Gray-edged.—In this section the outer edge only is green, but so thickly powdered that the green is scarcely discerned. Gray-edged varieties are easier to obtain than either white or green. The best gray-edged is George Lightbody, which is a model of what an edged Auricula ought to be. Lancashire Hero is also very good.

White-edged.—These are distinguished from the gray merely by the denser coating of farina on the margin, which in some instances is as pure and clear a white as the centre.

Selfs.—These, as the name suggests, have a uniform colour surrounding the white centre; this colour should be solid, uniform throughout, and of the same shades as in the edged flowers generally.

Cultivation.—Auriculas are propagated by seeds and offsets, the former to obtain new varieties, and the latter to increase the stock of any particular variety.

To raise new varieties, select only the best varieties as breeders. The seed-bearer should have plenty of vigour and a good habit. Remove the anthers with a pair of sharp-pointed scissors before the pollen is ripe. This is necessary to prevent self-fertilization. The pollen parent should belong to the same section as the seed-bearer. The seeds ripen in July, and ought to be sown at once in pans, which should be placed in hand-lights on the north side of a wall as being the coolest place at that time of year. The seeds will begin to vegetate in about three weeks, and the seedlings may be pricked out as soon as the first true leaf is formed, about a dozen or so into a 3-inch pot; they are then potted on singly as they require it. A suitable potting material is yellow loam four parts, leaf-mould one part, and one of decayed manure. Should the seeds sown in July not all vegetate in the autumn, they will remain dormant until February, when seedlings should appear freely. Seeds sometimes lie for twelve months before germinating.

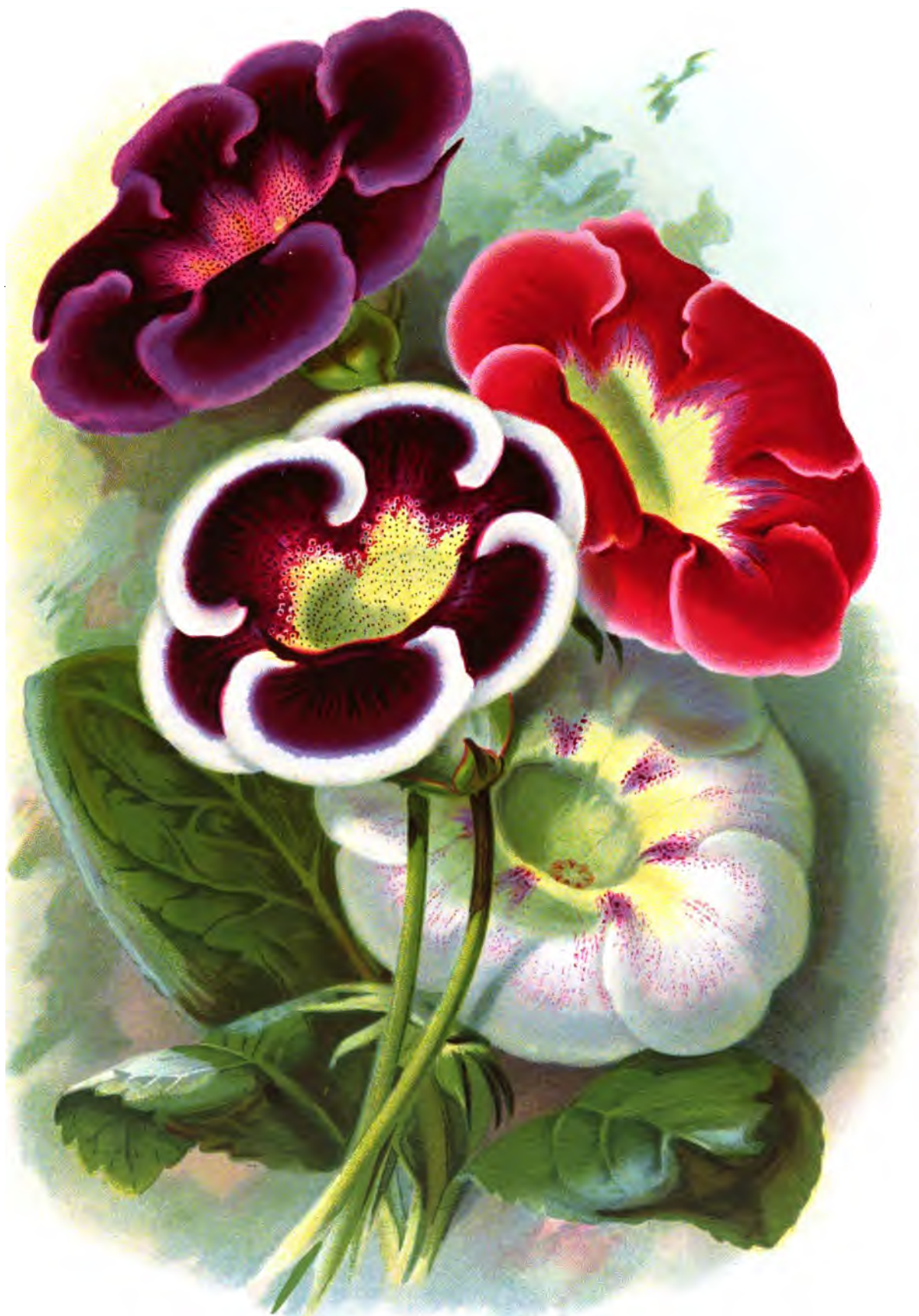
Offsets, although generally freely produced by mature plants, sometimes will not develop on one for years. They must be carefully removed from the parent plants with a small portion of roots attached, and planted separately in a small pot in sandy soil. They should be placed in a hand-light until they become established, when they may be repotted. They take at least twelve months to grow into good flowering plants.

The season of growth in the Auricula is from February till June; active vegetation is then suspended till the beginning of August, when it is resumed, continuing till about the middle

GLOXINIAS

The Gloxinias of gardens have been bred from several forms of a species of Sinningia, namely *S. speciosa*, which was introduced from Brazil in 1817, and again in 1842 when a large form of it was obtained from the Organ Mountains. The introduced plants had nodding purple or white flowers, and from these have been bred the many beautiful variations now to be obtained. They come true from seeds, and good flowering examples may be grown from seeds within the year. The tubers increase to a large size in a few years, and it is possible to grow single plants a yard across by carefully wintering the tubers in dry soil and treating them liberally whilst growing. Gloxinias are among the most useful of warm-house plants. They do not require great heat, very fine examples having been grown in a warm greenhouse. Specially good varieties can be multiplied from leaf-cuttings; that is, by simply laying a healthy leaf flat on the surface of sandy soil and covering it with a bell-glass.

The true Gloxinia is represented by the robust tall-stemmed *G. maculata*, which has tubers like an Achimenes and axillary blue flowers.



GLOXINIAS

of October, from which time till February the plant remains in a state of rest. With regard to treatment during these periods, many modes have been recommended; but in our opinion no directions are plainer and better than those of Dr. Horner, who says:—"The pots for a full-sized plant should not exceed 4 inches at the top and 3 inches at the bottom, inside measure; they should also be made $5\frac{1}{2}$ inches deep, to allow of abundant drainage, and should not be hard-baked, but left as porous as possible. It is a great and almost universal fault to use pots of too large a size. The best time for potting is immediately after the plants have bloomed; for, on account of the long previous confinement in the frame, the frequent waterings, and the excitement of blooming, the Auricula is very apt to contract disease, especially rot or decay in some part of the main or tap root, as it is called. This, in repotting, is at once detected, and consequently the life of the plant saved. Moreover, by early potting ample time is given for the pot to get well filled with young healthy roots before the approach of winter—the great secret of a vigorous bloom the following spring; *neglect of yearly repotting is a great evil.*

"The important operation is thus performed: First, put at the bottom of the pot at least $1\frac{1}{2}$ inch of crocks of broken garden pots; on these place a thin layer of decayed leaves unbroken up, which will prevent the soil from filling up the interstices between the crocks, and, moreover, furnish a most acceptable nidus for the roots of the plants. Next, fill up the pot within about 2 inches or so with the compost, leaving it slightly cone-shaped; on the top of the cone put a little sand, on this place the end of the tap-root, and, having disposed the roots regularly over it, let the pot be filled nearly to the brim, so that the soil just covers the insertion of the lowest leaf. Now strike the pot smartly two or three times on the ground, and then remove it to its summer quarters, when water must be given just sufficient to moisten the soil, and repeated at the end of a week, not before. In filling the pot with compost I always put in about three fingers' full of decayed or rather decaying leaves, not leaf-mould—a pinch here and there. In repotting the following year an unusual mass of roots will be found surrounding and piercing them through and through; they at once afford most acceptable nourishment and drainage. Previously to the operation of potting, the plant must be prepared by carefully crumbling off the old soil with the fingers and then washing the roots in

water, in order that any decay or disease may be detected, in which case it should be effectually cut out with a sharp knife, and the main root should then be shortened to within 1 inch of the leaves, leaving only the young and new fibres or roots. One great and fatal cause of the dwindling and disease of Auriculas is the leaving too long a tap-root; it will most assuredly decay and kill the plant. When it is desired to save seed the operation of potting must be delayed till August.

"The summer situation of the Auricula is all-important. As it naturally delights to grow in open and elevated regions, as on the Alps, so its place and position in the garden must be comparatively high and of free exposure. The pots should stand on planks, which are raised 2 feet from the ground, and placed by the side of a wall or hedge having a north-east aspect, and without awning or covering. Here they may be safely left till November; for if they are annually repotted, properly trimmed at the root, have sufficient drainage in the pots, and if due attention, moreover, be given to them from time to time (as by carefully twisting off decayed leaves, stirring the surface soil occasionally with the point of a knife), the much-talked-of rot need not be dreaded; but if these directions as to potting, just described, have not been followed, and the plants have not been elevated on planks the required distance from the ground, and consequently left in the usual susceptible state of disease, by all means let a temporary awning be erected over them if the summer prove wet.

"In November they may be placed in the frame, giving them all the air possible, as by letting down the front lights and opening the door behind—the top lights being kept on in case of rain. Watering must be gradually withdrawn, so that during December and January the soil be just kept from being absolutely dry; if it be kept wet or damp, the plants will be in great danger of contracting disease and of suffering from frost. In winter, during intense frost the frame must be protected with efficient covering; two stout blankets, with an outer coverlet of tarpauling, I have found the best, and, in the end, the cheapest materials. If not protected from severe frost many of the flower-stems will be found dead or with only two or three pips at the blooming time. In winter, during milder days the plants should have sufficient air.

"About the end of February, and during March, they must have all the air possible, and

also should be exposed, by removing the top lights, to frequent gentle showers: nothing is so invigorating. They must now also be top-dressed with a compost of two parts cow-manure and one part loam, having previously removed the old soil to about the depth of an inch. At the beginning of April, when they have pushed up their flower-stems, they must not longer be exposed to showers of rain, but the soil must, to the end of the blooming season, be preserved in a moist state. As the pips, if frosted when about to expand, will never bloom flat, the frame must be carefully protected, as just described, every night. In watering the plants great care must be taken to avoid the foliage; and if a drop has accidentally fallen into the crown of the plant it must be extracted by means of a camel-hair pencil, or decay will probably be induced. A small watering-pot, with a spout $1\frac{1}{2}$ foot long, bent at the end, and then contracted to the diameter of a goose-quill, should always be used for the purpose of watering.

"When the pips are just expanding into bloom, the frame, which has hitherto been exposed to a southern aspect, should be removed into the shade; or, what is more feasible, the plants may be placed under hand-glasses in a calm and shaded part of the garden, air being admitted at the bottom. The best plan, however, is to remove the plants into a common garden frame, placed in a shaded part of the garden, with the benefit of two hours' morning sun. The pots are not placed on the ground, but on shelves, graduated according to the fall of the glass lights. Slide-doors are made in the front and back of the frame, by which means any quantity of air can be admitted freely, to circulate around the bottom, sides, &c., of the pots and plants; it is most injurious to admit air in the common way, by tilting up the glass lights, as the cold air is thus suffered to blow directly upon the expanding blooms; hence the very great advantage of the contrivance just described. As the pips expand, the smallest, least perfect, and overcrowded ones must be carefully thinned out, leaving a truss of five, seven, or nine. When in full bloom the plants may be removed to any other situation the grower may fancy, as to a cool, airy greenhouse, where their beauties can be more conveniently seen and examined."

From May until January the flowering plants should be under a north wall. About the end of January they should be put into a slightly-heated house, so that they may develop their

flower trusses. If kept in frames, they must be covered with mats at night and uncovered again in the morning.

The Auricula is often infested with green-fly. This can be destroyed by tobacco fumigation or removed with a soft hair-brush dipped in tobacco-powder. The woolly aphis (*Trama auriculæ*) also attacks the Auricula, and is not easily destroyed. Tobacco-powder will kill those insects that cluster about the neck of the plants above-ground, whilst those on the stem underground must be removed when the plants are repotted. This insect is easily recognized by its white woolly appearance and its skin.

Auricula fanciers who grow for exhibition will find that the plants require very careful handling to get them on the exhibition table in good form. Only one truss should be allowed on each plant, and this should be supported with a neat stick. When they have to be carried long distances by rail, the plants are turned out of their pots, and the ball of earth and roots wrapped tightly round with a piece of calico or any thin cloth. In this way a man can easily convey fifty or sixty plants to the place of exhibition in a light box. Flower-pots and green moss are provided at the place of exhibition.

Alpine Auriculas, when grown in pots, are treated very much the same as the show section. As hardy plants for the rock garden they are most useful, and they are effective in the flower border, standing the winter out-of-doors in a well-drained loamy soil. Plants established in the rock garden for ten or fifteen years, receiving no other attention than a dressing of rich soil every spring, have produced upwards of a hundred trusses at once.

Show Auriculas are also quite hardy, but as their flowers, and sometimes the leaves also, are thickly coated with farina, a shower of rain is apt to disfigure them.

Selection of varieties in each section:—

Show Auriculas.

Green-edged.—Abbe Lizst, Colonel Taylor, Dr. Hardy, James Hannaford, Lycurgus, Prince of Greens, Rev. F. D. Horner, Talisman.

Gray-edged.—Alexander Meiklejohn, Colonel Champneys, Dr. Horner, Frank Simonite, George Lightbody, John Waterston, George Rudd, Lancashire Hero, Mabel, Maria, Marmion, Mrs. Moore, Rachael, Ringleader, Robert Trail, Silvia, William Brockbank.

White-edged.—Acme, Ann Smith, Beauty, Conservative, Dr. Kidd, Earl Grosvenor, Glory, Heatherbell, John Simonite, Lady Sophie Dumaresque, Magpie, Miss Prim, Miss Woodhead, Mrs. Dodwell, Reliance, Smiling Beauty, Snowdon's Knight.

Selfs.—Black Bess, Charles J. Perry, Ebony, Eliza, Engineer, Heroine, Lord of Lorne, Mrs. Douglas, Mrs. Potts, Negro, Pizarro, Primrose Day, Rev. Charles Kingsley, Sapphire, Sir Lancelot, Sir William Hewitt, Sunshine, Vulcan.

Alpines.

Gold centres.—Amelia Hardwidge, Ben Simonite, Comet, Defiance, Diadem, Emperor Frederick, Evelyn, Florrie Henwood, Fred Copeland, Hebe, Hotspur, John Ball, Love Bird, Minstrel, Miss Blackburn, Miss Mollie, Miss Moon, Mrs. Ball, Mrs. Douglas, Mrs. Martin, Mrs. Thomson, Mrs. Walker, Mrs. Wheelwright, Mungo M'George, Nellie Hibberd, Olympia, Pallas, Perfection, Roland, Sunrise, Unique, William Coomber.

White and cream centres.—Ada Hardwidge, Countess, Dorothy, Edith, Lady Henry Grosvenor, Lady Howard de Walden, Mary Francis, Mrs. Harry Turner, Romulus, William Brockbank.

Azalea indica.—The greenhouse or Indian Azalea has a history analogous to that of the Chrysanthemum in regard to its introduction, cultivation, and improvement in Europe. In the *Botanical Magazine*, t. 1480 (1812), it is figured and described as "a very rare plant, which has been long anxiously sought for by cultivators of curious and scarce exotics. We believe there are not above three or four individuals of it in the country, and of these only the one in the collection of James Vire, Esq., from which our drawing was taken, has as yet produced any flowers." In the same place it is stated that Kaempfer enumerated twenty-one varieties cultivated in Japan, including white, red, yellow, purple, and scarlet, with spots of the most contrary hues. Fortune says of this species: "Every mountain and hill in the central and southern provinces of China is covered with these beautiful plants. They are like our own Heaths, and quite as abundant. By far the finest are cultivated in gardens, indeed it was only in gardens that I could find any worthy of introduction into England." The Dutch cultivated *A. indica* in 1680, but soon lost it, and it was not reintroduced until the beginning of the present century. Knight, of King's Road, Chelsea, purchased in 1833 five varieties, one double-flowered, two reds, and two large-flowered, from a sailor who had brought them from China. Low & Co. advertised twenty-one named varieties in 1841. Since then the French, the Belgians, and others have crossed and bred these Azaleas with really wonderful results.

A. amœna, *A. obtusa*, *A. calyciflora*, well-known garden plants, are merely geographical varieties of *A. indica*. They are all hardy in the south of England. Two other hardy forms have lately been distributed by Messrs. J. Veitch & Sons,

namely, Daimio and Mikado. In some parts of England the old white *A. ledifolia* is hardy.

Propagation.—Azaleas can be raised from seeds sown as soon as ripe in well-drained pans of finely-sifted peat and sand, placing them in a brisk heat and shade. As soon as the seedlings



Fig. 512.—*Azalea indica*, single.

are large enough to handle prick them out in 6-inch pots of sandy peat soil, keeping them in these nursery-pots until they get several leaves each, after which pot off singly in 3-inch pots, in sandy peat, and place them in a warm, moderately moist atmosphere, where they will have sufficient light to keep them stout and robust. When they have grown 4 or 5 inches high, nip out the points. The generally adopted method of propagation, however, is that of grafting, using as a stock the common white, or the variety called Sir C. Napier. All that is necessary is to have the shoots of the stock and the grafts in a similarly half-ripened condition; remove the leaves at the point where they are to be joined, and splice-graft them. Place them in a shaded propagating-frame or under bell-glasses in a temperature of about 65°, and in a few weeks they will unite, when the ligatures must be taken off, keeping the plants growing, and stopping them early to cause them to break. The operation may be performed any time during the spring and summer, so that the grafts will have time to take before the short days

arrive. It will be advisable to keep the plants through the winter in a temperature of 50° during the night, so that they may go on growing slowly; for if allowed to go to rest in a cool house they will lose many of their leaves. Large plants of inferior kinds, if their roots are



Fig. 513.—Azalea, double.

in a healthy condition, may be grafted in the way described, putting on as many shoots as desired. Previous to this the shoots of the stock should be well thinned out to a few above the number it is intended to graft. After grafting, treat them as recommended for the small ones. Azaleas increase freely from cuttings of the half-ripened wood in silver sand in a brisk heat; but, unless for the propagation of stocks, it is not desirable to grow them from cuttings, as they rarely do so well as grafted plants.

Soil and Potting.—Azaleas can be grown in either light loam or peat, but the latter is much the best. It should be rich and fibrous; hard peat, such as is found where wild heather exclusively grows, is not good for them. As the plants get large enough to occupy 5-inch or 6-inch pots, use the peat in a more lumpy state than is required for them in their earliest stages. A sufficient quantity of sand must be used, one-sixth part will not be too much, mixing it well before use. Drain the pots well, as Azaleas cannot possibly be kept in health if the soil gets at all waterlogged. They do not

require so much root-room as many things. After they have got sufficiently large to occupy 12-inch or 15-inch pots, they will not need a shift oftener than once in two or three years; and when in 18-inch or 20-inch pots they can be kept even longer in a vigorous healthy state without more room, by the occasional use of liquid manure when growing. The best time to pot is about a month after their blooming is over, as before this their roots are not sufficiently active. In potting, the soil must be made quite solid by a free use of the potting-stick. The soil-ball of unhealthy plants may be reduced sufficiently to again occupy the same size of pot with fresh soil.

Stopping and training must be attended to in the early stages of growth, or the plants soon get naked and bare at the base. Stop the points of small plants, and when they have broken and pushed several shoots some length, train the strongest down so as to bring them to the rim of the pot; but until they get up to something like a half-specimen size, do not attempt to keep them too close or bushy by over-stopping, or their progress will be unduly retarded. As they get large, train them into the shape they are ultimately to bear; a rounded pyramid (fig. 514), not too much pointed nor made too even in outline, looks the best, and suits the natural habit of the plant; but in all cases keep the strongest branches down near the base; if the reverse of this is done, by letting the most vigorous shoots run up to the top they will so far take the lead as ultimately to starve the weaker shoots at the bottom. Use no more sticks than are necessary to support the plants, and do not make them too formal. Give plenty of light at all times.

The Belgian nurserymen make a speciality of the Azalea, hundreds of thousands being grown and distributed by them annually. Their plants are generally mop-shaped, the stem, from 9 inches to a foot long, being the stock, and supporting a head of crowded shoots. These plants can be bought for much less than it would cost to grow them in this country. They may be grown on and trained into any desired shape.

Temperature.—Although Azaleas when at rest will bear slight frost without injury, it is not desirable to subject them to a lower temperature than 35°; and in the case of small stock 45° in winter is low enough. During growth, and until the flower-buds are set, a temperature of from 55° to 65° at night, with a rise of 10° by day, is good for them, syringing them every afternoon so as to thoroughly wet the

leaves, and closing the house with the sun upon the glass. In the earlier part of the growing season they do not require so much air, but some must be given every day to impart strength to the wood and leaves. In the early stages of growth they will also want



Fig. 514.—Pot-grown Azalea, pyramid-shaped.

slightly shading in sunny weather; but this must not be overdone, or it will make the leaves thin and weak. As growth approaches completion and the buds are formed, give more air, reduce the moisture in the atmosphere, and dispense with shading. For plants that have flowered late it will be necessary to use fire-heat later, as also in the northern parts of the kingdom during sunless weather in the summer. In favourable localities in the southern parts of the kingdom Azaleas may be turned out-of-doors with decided advantage after the growth has become hardened. A warm sunny spot should be chosen so as to thoroughly ripen the wood.

Watering.—From the time, early in the spring, when the plants begin to push out young growth before flowering, all through the blooming season, and whilst growing, they must be well supplied

with water at the roots, giving less during their time of rest. If watered too freely early in the season there will be a tendency in the stronger-growing kinds to push early woody shoots at the expense of the flower-buds.

Insects.—Azaleas are liable to suffer from the attacks of thrips and red spider. If these pests get possession they do great harm, injuring the leaves, causing their premature falling off, and affecting the colour and size of the flowers. Two or three fumigations on consecutive evenings will stop the thrips; whilst by a free use of the syringe both these and the red spider may be kept under.

Selection of the Best Varieties:—

- A. Borsig.* White, wax-like, fine form, semi-double.
- Alba (indica alba).* For cutting, still one of the best.
- Amena.* Purplish-crimson, good forcer.
- Amena Caldwelli.* A form with larger flowers.
- Apollo.* Magnificent white, striped, large.
- Baron N. de Rothschild.* Rich purple, very free, double.
- Bernhard Andreas.* Dark-purple, semi-double.
- Brilliant.* Orange-scarlet, a late bloomer.
- Calyciflora.* Salmon-red hose-in-hose small flowers.
- Cedo Nulli.* Crimson, one of the darkest.
- Charles Leirens.* Dark-salmon, semi-double, good forcer.
- Charles Van der Bank.* Dark-purple, very free.
- Charmer.* Bright-amaranth, good substance and form.
- Criterion.* Blush-pink, spotted in upper segments.
- Deutsche Perle.* The finest double white; reliable forcer.
- Dr. Livingstone.* Deep rose-purple, large.
- Duc de Nassau.* Large, dark-purple, a profuse bloomer.
- Empress of India.* Rosy-salmon, edged white, semi-double.
- Flag of Truce.* Pure-white; double; one of the best.
- Flambeau.* Deep-crimson, very distinct.
- Flower of the Day.* White, with rose stripes.
- James Veitch.* Scarlet, in the way of *Stella*.
- Jean Vervaeke.* Rich salmon, striped white.
- Madame J. Vervaeke.* Delicate-rose, margined white.
- Madame L. Van Houtte.* White, flaked rose and scarlet.
- Madame Van der Cruyssen.* Rose, dark spot on upper petals.
- Maddeline.* Semi-double, pure-white.
- Magnet.* Deep rosy-pink; free.
- Mars.* Orange-red, spotted with crimson.
- Mrs. Turner.* Bright-rose, margined white, good forcer.
- Narcissiflora.* Early double white, lasting well.
- Obtusa.* Similar to *Amena*, flowers orange-scarlet.
- Obtusa alba.* A white form.
- Pharilde Mathilde.* White, striped cerise, large, double.
- President O. de Kerchove.* Salmon-pink, spotted, double.
- Reine de Portugal.* White, double; excellent for forcing.
- Roi de Hollande.* Deep-crimson, spotted black; excellent habit.
- Roi des Belges.* Scarlet, feathered with carmine, large.
- Sigismond Rucker.* Bright-salmon, with white edge.
- Souvenir du Prince Albert.* Double, deep-rose, edged white.
- Stella.* Orange-scarlet and purple spotted.
- Vervaekeana.* Bright-pink, margined white, semi-double.
- Vittata.* White, flaked violet; early.

[J. H.]

Begonia (Tuberous Section).—The most valuable addition to garden plants made in the last twenty-five years is undoubtedly the Tuberous Begonia. It had its origin in three or four species introduced from the Andes of Peru and Bolivia by Messrs. Veitch & Sons, viz. *B. boliviensis* (1864), *B. Pearcei* (1865), *B. Veitchii* (1867), and *B. Davisii* (1876). These are all large-flowered, brightly-coloured plants of quite sufficient attractiveness to secure a place among



Fig. 51A.—Tuberous Begonia, single.

favourite garden plants; but their claims have been eclipsed by the splendour of their progeny, and they are seldom seen in gardens now. "The series of hybrids distributed by our firm between 1870 and 1880 formed the foundation of the magnificent race we now possess, which, by the energy of the French and other breeders, have reached a development quite unlooked-for at first" (Veitch). The principal breeders of these plants have been Messrs. Veitch, Laing, Henderson, Cannell, Ware, and Lemoine.

The seedlings vary considerably in height, size of leaf, sturdiness of flower-stalk, as well as in the size, form, and colours of the flowers. The largest single flowers are 6 or 8 inches across and almost orbicular in outline, whilst among doubles there are flowers which resemble Camellias, Gardenias, Carnations, and Hollyhocks. They vary in colour from the purest white to pink, scarlet, and crimson, and there are numerous shades of yellow. It is difficult to imagine that much more can be done to

improve the flowers in size, form, or colour, but there is room for improvement in the length and sturdiness of the flower-stalk. The colours generally come true from seeds, which are readily produced, and as their cross-fertilization is simplified by the male and female organs being in different flowers, there is every inducement for the grower to become a breeder.

Propagation.—The two methods practised for these plants are those of cuttings and seeds. Cuttings are employed only when it is desired to multiply any special variety. They are formed of young shoots taken from near the base of the plant, and they should be planted as early as possible so that they can form good tubers early. If too many shoots start from a tuber when it begins to grow in spring, a portion may be cut off close to the tuber and used as cuttings. They root freely if planted in sandy soil against the side of a thumb-pot and placed in a warm propagating frame.

Seeds should be sown in boxes or pans of light sandy soil in January or February, if intended to produce nice flowering-plants by the summer. They vegetate freely in a temperature of about 70°. As soon as the seedlings can be handled prick them out into boxes or pans half an inch or so apart, to be pricked out again when the plants get crowded; after a time pot them off singly, and shift into larger pots as the plants increase in growth. If intended for the open garden they should be hardened off by about the middle of May to be planted out in the first week of June. One-year-old tubers form splendid plants. The tubers should be allowed to rest from the end of October until the first week in March, when they may be potted up again. They rest best when shaken free of soil and placed in boxes of dry cocoa-nut fibre on a shelf in a dry house or shed, or they may be put under a greenhouse stage if kept dry.

To obtain a succession of bloom, some of the tubers may be potted up fortnightly from the first of February, and started in heat. The last batch of tubers started in May may be placed at once in a greenhouse, where they often make finer plants than those forced earlier. The young plants must be placed as near the roof-glass as possible.

A good compost for Begonias is fibrous loam two parts, leaf-mould one part, and a small quantity of decayed, not artificial, manure and sand. The compost should be moist. Do not over-pot to begin with. Small tubers may be planted in 60-sized pots, the larger in small 48's, to be repotted again when the pots are

well filled with roots. It is better not to water them for a few days after repotting. Drain the pots well for the last shift, placing some moss or fibre over the drainage. Newly-potted plants require careful watering until the roots have taken hold of the new soil. From June onwards plants grown in the greenhouse should be aired freely, avoiding strong draughts night



Fig. 516.—Tuberous Begonia, double.

and day. When the pots are well filled with roots, cow-manure water will help the flowers to brightness in colour and large size. A small quantity of soot may be added by tying it up in a bag and stirring it in the water. Artificial manures, if used at all, must be used very sparingly. Some of the plants require to be staked, but those of sturdy habit do not need support. Varieties with weak stems do better in baskets, allowing the stems to hang down. For use in the flower-garden, varieties with decided colours and sturdy habit should be selected. A sheltered position is best for them. Of course it will not do to plant the dry tubers at once in the open ground. They must be started in a heated pit or hot-bed not later than the first week in April, but the heat must not be so excessive as to injure the tubers.

Begonia (Miscellaneous).—Under this heading we include those Begonias which are shrubby or evergreen, and which usually flower most profusely in winter and spring, although with a little management they may be had in flower at almost any time. The majority are true species, but there are also now numerous hybrids which are improvements upon the species, and there is a prospect of a race of Begonias of this section which will fill as large a place among winter-flowering stove and greenhouse plants as the tuberous section does among those of summer.

The cultivation of the whole of those here mentioned is as easy and on the same lines as that of *Coleus* or *Fuchsia*, the only difference being in the temperature they require, which should be that of an intermediate house (55°–70°). They are easily propagated from cuttings at any time of the year. Those that do not branch naturally should be made to do so by stopping. They prefer an open soil, moderate watering, and shade from bright sunshine; they object to strong stimulants, weak liquid manure now and then being all they require in the way of extra nourishment. Most of them mature seeds (hybrids are, of course, not capable of propagation in this way), which should be sown and treated as for *Gloxinias*. The following is a selection of the best species and hybrids:—

B. albo-picta.—Shrubby, leaves 2 inches, green with white circular spots. Brazil.

B. coccinea (*corallina*).—Stems Bamboo-like, 6 feet or more; leaves green; flowers numerous on drooping peduncles, blood-red, very durable. Brazil.

B. decora.—Stem short; leaves hairy, coppery-red with yellow bands. Perak.

B. Evansiana.—Tuberous with annual stems; leaves red and green; flowers on slender axillary stalks, rose-coloured. Bulbils numerous in leaf-axils. China, &c.

B. fuchsoides.—Root-stock woody, stems tall; leaves small, red when young; flowers rich scarlet in drooping panicles. Mexico.

B. gogoensis.—Stem tuberous; leaves oval with 4-angled stalks, green with bronzy blotches, red underneath; flowers small, pink. Sumatra.

B. Haageana.—A grand plant, forming a large bush with hairy, brown-green leaves, and long stout peduncles with large persistent rose-coloured flowers. Brazil.

B. heracleifolia.—Stem a short rhizome; leaves large, palmate, with long, fleshy, hairy leaf-stalks; flowers on tall, branched panicles, small, rosy-white. Mexico.

B. imperialis.—Stem short; leaves heart-shaped, hairy, brown with bands of gray-green. Flowers on erect stalks 3 inches long, small; *maculata* has more conspicuous blotches; *amaragdina* has green leaves. Mexico.

B. incarnata (*insignis*).—Stem 2 to 3 feet; leaves medium, reddish beneath; flowers rose-coloured, numerous, on arching peduncles. There are numerous varieties,

such as *acuminata*, *maculosa*, *purpurea*; also red-purple forms named Arthur Mallet, M. Hardy, The Queen, &c. This species has been crossed with *B. Rex*. Mexico.



Fig. 517.—*Begonia Rex*.

B. Lynchiana.—Not unlike *B. nitida*; stem 3 feet; leaves bright-green, ovate, 6 inches long; flowers large, bright-red, in large panicles 6 inches across. It has been crossed with *B. semperflorens*. Colombia.

B. maculata.—Stem 3 feet; leaves 6 inches long, green above and spotted with glistening white, crimson beneath; flowers in crowded clusters, white. Brazil.

B. manicata.—Stem thick, creeping; leaves large, with long stalks clothed with red scale-like hairs; flower-stalks 1 foot long, bearing a large loose panicle of pink flowers; var. *aureo-maculata* has leaves blotched with yellow. Mexico.

B. metallica.—Stem 4 to 6 feet, freely branched; leaves 3 to 6 inches long, hairy, green, with a metallic shade; flowers bluish-white. Mexico.

B. natalensis.—Root-stock tuberous; stems annual, 1 foot high; leaves small, green or mottled; flowers numerous, white, on slender erect peduncles. South Africa.

B. nitida.—A useful old garden plant 2 to 3 feet high, with smooth stems and leaves, the latter glossy-green; flowers large, numerous, on long peduncles, pink. Jamaica.

B. peltata.—Stem 1 foot or more; leaves fleshy, ovate, 6 inches or more long, clothed with a silvery tomentum; flowers small, white, on long erect peduncles. Mexico.

B. Rex (fig. 517).—Stem tuberous, fleshy; leaves with long stalks, blade 1 foot across, dark metallic-green with a zone of silvery-gray. There are many varieties, all of the easiest culture and most useful in indoor gardening, either for stove or greenhouse. Himalaya.

B. sanguinea.—Stem 3 feet, branched; leaves dark glossy-green above, crimson beneath; flowers small, white, on long branched peduncles. Brazil.

B. semperflorens.—A variable plant, probably an annual when wild. Stems tufted 6 to 18 inches high; leaves ovate, glossy-green tinged with red; flowers numerous, white or rose-coloured. It has been crossed with several species. There are numerous varieties, which are dealt with in the chapter on bedding plants. Brazil.

B. socotrana.—Root-stock formed of closely-packed fleshy buds; leaves peltate, orbicular, green, 6 to 9 inches across; flowers on slender erect stalks, bright-rose, very persistent. This has proved a most useful breeder since its introduction in 1880. There are numerous hybrids between it and other species, all of them good garden plants, which are dealt with elsewhere. Socotra.

B. Sutherlandii.—Like *natalensis*, but the stems and leaves are tinged with red, and the flowers are coloured salmon-red. South Africa.

The best of the hybrids are the following:—*Ascotensis*, *Credneri*, *Gloire de Lorraine*, *Gloire de Sceaux*, *Ingramii*, *John Heal*, *Lemoinei*, *Paul Bruant*, *President Carnot*, *Triomphe de Lemoine*, *Triomphe de Nancy*, *Winter Gem*. By far the handsomest of all evergreen *Begonias* is that named *President Carnot* (fig. 518), a hybrid between *B. coccinea* and *B. olbia*. It was raised by M. Crozy, of Lyons, in 1890. The stems grow to a length of 3 feet, or even thrice that if planted out. It has large leaves, and produces all the year round enormous clusters of large pendent coral-red flowers, most of them females, which hang on and keep fresh for many weeks. As a pillar plant in a warm house, or trained against the roof-glass in a low house, it is most effective.

Equally valuable is the small, herbaceous,



Fig. 518.—*Begonia President Carnot*.

annual-stemmed hybrid called *Gloire de Lorraine* (fig. 519), raised by M. Lemoine from *B. Dreggei* and *B. socotrana*. It has short, slender,

drooping stems, small bright-green leaves, and produces in autumn and winter large numbers of graceful peduncles clothed with bright-car-



Fig. 519.—*Begonia*
Gloire de Lorraine.

mine flowers, which hang a long time and are developed in slow succession for three months or more. It should be raised annually from leaf-cuttings inserted in February and treated as for Gloxinias.

Bouvardia.—Several species of this genus, all Mexican, have been utilized in the production of the useful race of garden plants now grown as Bouvardias. When properly treated they form pretty little shrubs, and they may be had in flower nearly the whole year round with a little management. It is a mistake to treat them as stove or even warm-house plants; the treatment recommended for the *Fuchsia* or winter-flowering *Pelargoniums* being more suitable for them. In the warmer parts of England they may be effectively used for summer bedding, and when the approach of winter threatens them they may be lifted carefully and planted in pots to flower in early winter in the greenhouse.

Some beautiful double-flowered varieties have been raised by the American florists, to whom also we owe the rich red-flowered seedling known as *President Cleveland*.

Propagation.—Cuttings of young shoots taken from old plants started in a warm house in February will root in a few weeks if planted in pots of sandy soil and covered with a bell-glass

in a propagating house. When rooted they should be planted singly in 3-inch pots in good fibrous loam to which has been added one-fourth leaf-mould and a sprinkling of sand, and kept in a night temperature of 60°, with a rise of 10° in the day; when the sun is powerful, shade a little, syringe them overhead in the afternoon, and close the house with sun-heat. The shoots should be stopped to induce the formation of numerous branches at an early stage. Some growers prefer to keep the plants growing steadily in 3-inch pots until the following February, when they are shifted into 5-inch pots; others shift into these pots in July, and as soon as the plants will bear it they are placed in frames in a sunny situation, giving them plenty of air in the day, and leaving a little on at night. During the summer they may be grown with the *Chrysanthemums*, *Fuchsias*, &c. If the pots are well filled with roots a little stimulant should be given. They may remain outside until the end of September, when they must be removed to a house or pit where a little heat can be turned on when the weather becomes cold. If flowers are required through the autumn a portion of the plants should be at once placed in a temperature of 65° at night; they will shortly begin to form buds, which will open in quantity for a time, and keep on pro-



Fig. 520.—*Bouvardia jasminiflora*.

ducing others to follow as they make additional growth.

Bouvardias require plenty of sunlight and free ventilation, and although they do not like

heavy watering, whilst growing they should not be allowed to get dry. To rest them after flowering they should be placed in an airy house and kept dry for a few weeks, when they may be cut down, started in a moist warm house, and when new shoots are well advanced the plants should be shaken out and repotted. If wanted for a border or bed out-of-doors these old plants will serve admirably, and for this purpose they will not require to be repotted, hardening them off in the usual way to plant them out in June.

Bouvardias are sometimes attacked by aphids and thrips, which can be kept down by frequent tobacco fumigation. They are also subject to what is known as the Begonia mite, a terrible pest, for the eradication of which see chapter on Insect and other Plant Enemies, p. 67.

The following are the best sorts:—

Single.

Candidissima. White.
Dazzler. Scarlet.
Hogarth. Scarlet.
Humboldtii corymbiflora. White.

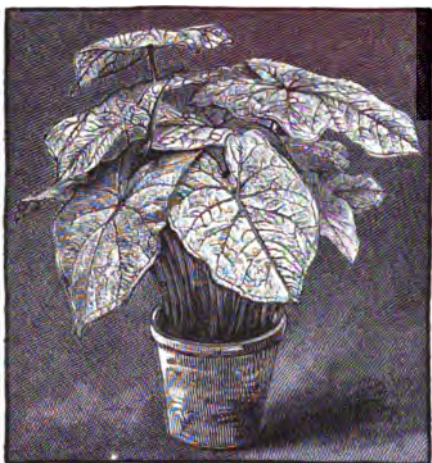


Fig. 521.—*Caladiums.*

Intermedia. Pink.
Jasminiflora (fig. 520). White.
Laura. Rose.
Mrs. Green. Salmon.
President Cleveland. Crimson.
Rosea multiflora. Rosy-pink.
Rosea oculata. Delicate-pink.
Scarlet Prince. Bright-scarlet.
The Bride. Blush-white.
Vreelandii. White.
Vulcan. Scarlet.

Double.

Alfred Neuner. White.
Flavescens. Yellow.
Hogarth, fl. pl. Scarlet-carmine.
President Garfield. Pink.
Schmidtii. Flesh-pink.

Caladium.—These beautiful stove plants are indigenous to tropical America, and besides the introduced species there are now numerous very fine hybrids and seedlings that have been bred chiefly from *C. pictum* and *C. Wightii*. The principal varieties are of French origin; Messrs. F. Sander & Co., J. Veitch & Sons, J. Laing, and the late F. Bause have also raised some excellent seedlings. Their cor-

date or sagittate leaves are profusely marbled, blotched, or veined with red, pink, and white, in many cases the deeper or more lively colours largely preponderating over the green portion, imparting to them great variety. Form and colour alike give them a most distinct character, and they are eminently fitted for associating, not only with ferns and other plants of elegant habit, but also with subjects of more massive growth and sombre hues. They are easily grown, one of the principal things to be observed in their cultivation being not to rest the tubers during the winter in too low a temperature. They are swamp-loving plants in a wild state, and although they may be kept through the winter in a state of absolute dryness, they are safest when left in the soil in which they grew and placed under the stage in a moist warm house.

They are increased by means of the young growths that are thrown up plentifully from the crown of the tubers in February, when they require to be shaken out of the old soil and potted in a light soil into small pots, plunging them in a tan or fibre bed kept at a temperature

of about 80°. Some growers prefer to cut up the tuber into as many pieces as it has buds; this is done, however, only when a number of separate plants are required. As they push into growth allow them plenty of light by placing them well up to the glass. They should be shaded during bright sunny weather only. Syringe them overhead every afternoon, and as soon as the pots are filled with roots move them into larger ones. The treatment as regards root-room, soil, moisture, and heat should be liberal, the hottest stove, a rich peaty or light loamy soil with plenty of sand and copious supplies of water being essential to their quick growth, and good specimens cannot be grown unless they are forced up in about three months from the time of starting. Pinch out all flower-buds as they appear. As the autumn approaches they will show signs of going to rest by ceasing to make fresh leaves, and those they already possess will become yellow. They should then be moved to a drier house and allowed to get fairly dry until all the leaves are dead, when the pots can be placed under a stage as already recommended.

If small or moderate-sized plants are required, they may be grown in 6-inch pots, and propagated every spring so as to have a succession of tubers for the purpose. If the intention is to grow them into large specimens several tubers may be planted in one large pot or pan.

From the acrid nature of their juices these plants are not palatable to many insects; aphids will sometimes attack the young growths, but they can be destroyed by fumigation; red spider will also occasionally make its appearance during the summer if the atmosphere is kept too dry, but it is easily destroyed by a timely use of the syringe.

There are very many named sorts. The following is a choice selection:—

Argyrites.
Donna Carmen Macedo.
Duchess of York.
Exquisite.
F. W. Moore.
Golden Queen.
Ibis Rose.
Joseph Chamberlain.
Lady Dorrington.
Lady Mosley.
Lord Derby.
Lord Rosebery.
Marquis of Camden.

Martin Luther.
Mikado.
Mrs. Bause.
Mrs. Iceton.
Mrs. McLeod.
Pantia Ralli.
Prince of Wales.
Raymond Lemoine.
Silver Cloud.
Silver Queen.
Sir Henry Irving.
Sir Julian Goldsmid.
W. E. Gladstone.

Calceolaria.—The herbaceous *Calceolaria*, like its companions the *Cineraria* and *Cyclamen*, has undergone an immense improvement

in the last quarter-century. It is supposed to have originated in a hybrid between *C. corymbosa* and *C. crenatiflora*, both Chilean species; and subsequent improvement has been largely due to the constant crossing of the best types and the selection of the most promising progeny. The seed, which is exceedingly small, should be sown in June in pots of fine sandy soil. A sheet of glass placed over the pot keeps



Fig. 522.—*Calceolaria*.

the soil moist and hastens the germination, but the glass should be turned each day. The soil should be rich and firm, but of a porous nature, and be kept damp by partially submerging the pot in water, and not by watering, however fine the rose used. The seedlings should be all through in about a week or ten days, and then the glass must be removed from the pot to give air, and the plants pricked out as soon as the second leaf appears. Mistakes have often been made at this point by leaving the plants too long in the seed-pot, treatment from which they never really recover. Similar soil is required, and the plants should be pricked out about 2 inches apart. It is important that the small and weaker seedlings should be pricked out as well as the strong ones. The utmost care is necessary in shading, as young leaves are soon burnt if once exposed to direct sunshine in a dry atmosphere. Towards the end of July or early August the plants should have four or five leaves, and be ready to be placed separately in thumb-pots. Good drainage at the bottom of the pot is most essential, and a rich porous soil with a slight mixture of silver sand is the best. The plants should be placed in a frame and have as much air as possible when the

weather outside is suitable, and be kept moist and in a growing state, as the least check lays them open to an attack of green-fly, to which the *Calceolaria* is so liable. Before the end of September they should be moved into larger pots, and kept under glass with moderate heat; the temperature should not be allowed to rise much over 40° or 45°. They should be again shifted into larger pots in which they are to flower in December or January. This must be done before any signs of buds appear. A good compost for the *Calceolaria* is 1 bushel good coarse yellow loam, $\frac{1}{2}$ bushel leaf-soil, 1 gallon silver sand, $\frac{1}{4}$ pint Sutton's A 1 Garden Manure, $\frac{1}{4}$ pint soot—well mixed a few days before use. The flowers should still be kept in a moist cool atmosphere until the flowering has thoroughly commenced, when they should be brought into the house in which they are to flower.

Though there is great variety of form and colour in the *Calceolaria*, the pure-yellow (Cloth of Gold) is the only one that reproduces itself true from seed. All the other varieties can be obtained from a packet of mixed seed if procured from those growers who make a speciality of the *Calceolaria*, for instance, Messrs. Sutton and Sons, whose exhibits are usually a feature at the June Exhibition of the Royal Horticultural Society.

Camellia.—This genus comprises about a dozen species of evergreen trees or shrubs. They are nearly all natives of China and Japan, these two countries being the source of the popular Garden Camellia (*C. japonica*) in its many forms, the first of which was introduced into England over 150 years ago. There is no record of its having ever been crossed with any other species, so that probably all the forms in gardens are the result of cultivation and selection from *C. japonica*, not only in Europe, but also by the Chinese and Japanese. According to Curtis, in a paper on Camellias printed in 1819, there were twenty-nine varieties in cultivation in England at that time, all of them introduced from Japan. Since then many varieties have been raised in France, Belgium, and Italy. The Camellia rarely seeds in England, although it sometimes produces its Apple-like fruits freely in the open air in Cornwall.

Other species worth growing in the greenhouse are *C. reticulata*, with large rose-red Pæony-like flowers; *C. Sasanqua* (fig. 523), like *C. japonica*, but smaller in leaf and flower; and *C. rosæflora*, a small-leaved shrub, with semi-double pink or

white flowers. Camellias are sufficiently hardy to withstand our winters out-of-doors in the warmer parts of this country; but as they bloom in the spring, the flowers are apt to be injured by cold and wet. Generally they are most satisfactory under greenhouse treatment.



Fig. 523.—*Camellia Sasanqua*.

A select collection will furnish a supply of flowers for four or five months.

Cultivation.—Camellias are best grown in cold houses protected from frost, where they can make their growth under the influence of sun-heat alone as the season advances. From 60° to 70° in the daytime will be sufficient when they commence to grow, with sufficient air to prevent weakly growth, allowing the temperature to fall again during the night. When the wood is matured and the buds formed, the temperature should be lowered and more air given. Whenever fire-heat is applied to accelerate the opening of the flowers it should not exceed 55°, sprinkling the stages and floor with water now and then to keep the atmosphere slightly humid. Large specimens should be grown in a span-roofed house, shading them during very bright weather. The practice of placing Camellias in the open air in summer is not always advisable; but if the position is not exposed, and the plants have partial shade, no harm is done. They should not be allowed to remain outside after October.

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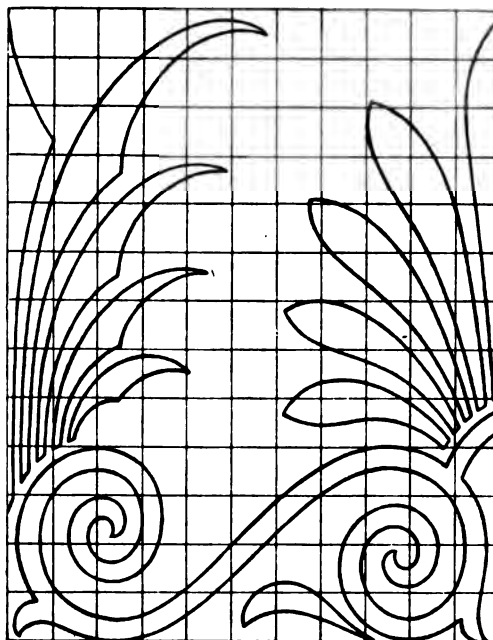
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There we have the counsel of perfection! Read novels! But what novels? "New-fangled books", as Hazlitt well said, "are like made-dishes in this respect, that they are generally little else than hashes of what has been served up entire and in a more natural state at other times. So, in turning to a well-known author, there is not only an assurance that my time will not be thrown away, or my palate nauseated with the most insipid or vilest trash; but I shake hands with and look an old, tried, and valued friend in the face—compare notes, and chat the hours away."

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